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Biology Laboratories Renovation
Project Manual
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Issue for Bid

CITY COLLEGES of CHICAGO
Harry S Truman
Education that Works

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SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

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

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

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

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

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 01: Provide all new light fixtures.

1. Base Bid: Re-Use and relocate existing 2’ x 4’ fluorescent lighting fixtures as indicated on Drawing A105.
2. Alternate: Provide all new 2’ x 4’ recessed direct/indirect LED lighting fixtures instead of re-using existing as indicated on Drawing A105.

B. Alternate No. 02: Provide all new lay-in ceiling panels.

1. Base Bid: Re-Use and relocate existing lay-in acoustical ceiling panels as indicated on Drawing A105 and specified in section 095113 “Acoustical Panel Ceilings”.
2. Alternate: Provide all new lay-in acoustical ceiling instead of re-using existing as indicated on Drawing A105 and specified in section 095113 “Acoustical Panel Ceilings”.

C. Alternate No. 3:

1. Base Bid: Provide wooden cabinets in Micro-Biology lab and Microbiology prep
2. Alternate: Provide metal cabinets only in Micro-Biology lab (2175) and Microbiology prep (2208) instead of wooden cabinets.

END OF SECTION 012300

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on the Project related to, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Project meetings.

B. Related Requirements:
   1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 33 23 “Shop Drawings, Product Data and Samples” for submission requirement for Coordination Drawings.
   3. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Section 01 77 00 "Closeout Procedures and Requirements" for coordinating closeout of the Contract.
   5. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.3 DEFINITIONS

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

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entities performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within five (5) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that 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 to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. 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 Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and 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 including phasing specifics.
   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. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

A. Responsibility: Each Contractor has the responsibility to submit Coordination Drawings when required per this Section. Each Contractor who has Assigned Subcontractors shall have overall responsibility for the Coordination Drawings of their Assigned Subcontractors.

B. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, and maximum utilization of space is required for efficient installation of different components or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
      a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
      b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
      c. Indicate functional and spatial relationships of components of architectural, structural, mechanical, and electrical systems.
      d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
      e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.

f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 23 “Shop Drawings, Product Data and Samples.”

3. Submit one electronic copy (pdf) of each Coordination Drawing submittal to the Architect

C. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings as required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components, if any.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing: Show the following:
a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:
a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

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

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
b. Digital Data Software Program: Drawings are available in AutoCAD operating in Microsoft Windows.

c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI via the Owner's Project Resource Information System Management for Capital Projects ("PRZM").
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

C. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five (5) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. If the Contractor believes the RFI response warrants change in the Contract Time of the Contract Sum, notify Architect and Owner in writing.

D. On receipt of Architect's action, immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
1. Identification of related Emergency Work Authorization and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than ten (10) days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises and existing building.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.
      y. Security.
      z. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned

parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for delivery of material samples, attic stock, and spare parts.
   f. Requirements for demonstration and training.
   g. Preparation of Contractor's punch list.
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   i. Submittal procedures.
   j. Coordination of separate contracts.
   k. Owner's partial occupancy requirements.
   l. Installation of Owner's furniture, fixtures, and equipment.
   m. Responsibility for removing temporary facilities and controls.

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

D. Progress Meetings: Conduct progress meetings at weekly intervals.
   1. Coordinate dates of meetings with preparation of payment requests.
   2. Attendees: In addition to representatives of Owner and Architect, 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
         1) Review schedule for next period.

      b. Review present and future needs of each entity present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Status of submittals.
         4) Deliveries.
         5) Off-site fabrication.
         6) Access.
         7) Site utilization.
         8) Temporary facilities and controls.
         9) Progress cleaning.
         10) Quality and work standards.
         11) Status of correction of deficient items.
         12) Field observations.
         13) Status of RFIs.
         14) Status of proposal requests.
         15) Pending changes.
         16) Status of Change Orders.
         17) Pending claims and disputes.

18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule 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 01 31 00

SECTION 01 35 16 - ALTERATIONS PROJECT PROCEDURES

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 special procedures for alteration work.

1.3 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's pre-bid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep existing items that are not to be removed or dismantled.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
   1. Schedule construction operations in sequence required to obtain best Work results.
   2. Coordinate sequence of alteration work activities to accommodate the following:
      a. Owner's continuing occupancy of portions of existing building.
      b. Owner's partial occupancy of completed Work.
      c. Other known work in progress.
      d. Tests and inspections.

   3. Detail sequence of alteration work, with start and end dates.
   4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
   5. Use of elevator and stairs.
   6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns at elevators. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.5 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
   1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, and specialists, shall be represented at the meeting.
   2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
      a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
      b. Fire-prevention plan.
      c. Governing regulations.
      d. Areas where existing construction is to remain and the required protection.
      e. Hauling routes.
      f. Sequence of alteration work operations.
      g. Storage, protection, and accounting for salvaged and specially fabricated items.
      h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
      i. Qualifications of personnel assigned to alteration work and assigned duties.
      j. Requirements for extent and quality of work, tolerances, and required clearances.
      k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.

   3. Reporting: General Contractor will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, General Contractor Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
    a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
    b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
        1) Interface requirements of alteration work with other Project Work.
        2) Status of submittals for alteration work.
        3) Access to alteration work locations.
        4) Effectiveness of fire-prevention plan.
        5) Quality and work standards of alteration work.
        6) Change Orders for alteration work.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed by Owner.

1.7 INFORMATIONAL SUBMITTALS

A. Alteration Work Subschedule:

1. Submit alteration work subschedule within thirty (30) days of date established for commencement of alteration work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

C. Alteration Work Program: Submit thirty (30) days before work begins.

D. Fire-Prevention Plan: Submit thirty (30) days before work begins.

1.8 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five (5) recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
   1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
      a. Construct new mockups of required work whenever a supervisor is replaced.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
   1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
   2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

1.9 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:
   1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
   2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:
   1. Repair and clean items for reuse as indicated.
   2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
   1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
   2. Secure stored materials to protect from theft.
   3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

E. Storage Space:
   1. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.10 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawings, preconstruction photographs, and preconstruction videotapes.

B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:
   1. Vending Machines.

D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
   1. Use only proven protection methods, appropriate to each area and surface being protected.
   2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
   3. Erect temporary barriers to form and maintain fire-egress routes.
   4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
   5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
   6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
   7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
   8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:
   1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
   2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:
   1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
   2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
   3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
   1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
   2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

F. Existing Roofing: Prior to the start of work in an area, install roofing protection[as indicated on Drawings].

3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:
   1. Comply with NFPA 241 requirements unless otherwise indicated
   2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
      a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
   1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
   2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
   3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
   4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
   5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.

6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
    1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings.

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
   1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 01 35 16

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Requirements:
1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities and utilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services, utilities and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

1.4 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 10 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

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

E. Dust Control Plan: Submit plan for limiting dust from sitework affecting adjacent occupied buildings and spaces.

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. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Owner will provide an area, Room 146, if required, on the property site for utilization as a Field Office. Refer to drawing G101.

2.2 EQUIPMENT

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

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. General Contractor Office: There shall not be an office trailer allowed on site. Temporary space will be provided by Owner for use as the Contractor office, Room 146 on the first floor.

B. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials where indicated for incorporation into the final work.

3.2 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.
   1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company and Owner for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering nearby occupied buildings.

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

C. Electric Power Service: Connect temporary service, as directed by Owner.

D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.

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

D. Waste Disposal Facilities: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
   1. Construct barricades with wood framing and fire-retardant-treated plywood on building occupants' side.

D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Prohibit smoking in all building areas. Comply with additional limits on smoking specified in other Sections.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 OPERATION, TERMINATION, AND REMOVAL

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

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

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. 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. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures and Requirements."

END OF SECTION 01 50 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Installation of the Work.
   2. Cutting and patching.
   3. Coordination of Owner-installed products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction
   7. Correction of the Work

B. Related Requirements:
   1. Section 01 10 00 "Summary" for limits on use of Project site.
   2. Section 01 77 00 "Closeout Procedures and Requirements" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   3. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
   4. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

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

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.

5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or which results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Electrical wiring systems.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or which results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Membranes and flashings.
    b. Equipment supports.
    c. Piping, ductwork, vessels, and equipment.
    d. Exterior curtain and store-front wall system.

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

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

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

3.2 PREPARATION

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

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

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

3.3 INSTALLATION

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

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

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

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

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

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

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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

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

D. 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.

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

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   5. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.

   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
      a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

   4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 OWNER-INSTALLED PRODUCTS

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

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

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.

   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

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.

D. 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.

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

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

H. 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.

I. 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.

J. 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.

3.7 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

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

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

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

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

3.8 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.

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

END OF SECTION 01 73 00

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Salvaging nonhazardous demolition waste.
   2. Recycling nonhazardous demolition waste.
   3. Disposing of nonhazardous demolition waste.
   4. Disposal of refrigerants and cooling system water.

B. Related Requirements:
   1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
   2. Section 02 82 13 “Asbestos Abatement Specification” for disposal of hazardous waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including the following:
   1. Construction Waste:
      a. Masonry and CMU.
      b. Lumber.
      c. Wood sheet materials.
      d. Wood trim.

e. Metals.
f. Gypsum board.
g. Piping.
h. Electrical conduit.
i. Packaging: Recycle 100 percent of the following uncontaminated packaging materials:
1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Provide handling, containers, storage, signage, transportation, and other items as required during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 01 51 00 "Temporary Facilities and Controls."

B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items Indicated for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.

5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Doors and Hardware: Except for removing door closers, leave door hardware attached to doors.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:
1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements in Section 32 93 00 "Plants" for use of clean sawdust as organic mulch.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

D. Fluorescent / HID Lights: Demolition or electrical contractor shall remove and store fluorescent, hid lights, and ballasts in a container and contact the University of Illinois, Facilities for disposal.

E. Batteries: Demolition or electrical contractor shall remove and store batteries in a container and contact the University of Illinois, Facilities for disposal.

3.6 DISPOSAL OF REFRIGERANTS AND COOLING SYSTEM WATER

A. Chilled Water Systems and Cooling Towers
1. Discharges from chilled water systems and cooling towers must follow the guidelines n the attached “UCSD-Draining Discharge Requirements” document. If cleaning agents will be used for flushing then the guidelines on the attached “UCSD-Cleaning Discharge Requirement” document must be followed. Glycol discharges with a total project volume of less than100 gallons and a typical BOD composition (less than 300,000mg/L), authorization from the sanitary district is not required. If there is reason to believe the BOD composition is atypical then BOD analysis is required prior to discharge. Samples can be taken to the sanitary district for analysis. If this is the case, F&S will provide the proper forms for analysis.
2. Glycol discharges greater than 100 gallons or which exceed the 300,000 mg/L BOD limit require prior written authorization from the sanitary district. In this case, the F&S Special Discharge Request Form shall be completed and returned to Environmental Compliance. Environmental Compliance will review the form for completeness and submit to the sanitary district for approval. Discharge cannot occur until the university received authorization.

B. Fluorescent / HID Lights: demolition or electrical contractor to remove and deliver fluorescent, HID lights and ballasts in container to UIUC F&S for UIUC F&S Shop to dispose.

C. Batteries: demolition or electrical contractor to remove and deliver batteries to UIUC F&S for UIUC F&S Shop to dispose.

3.7 Required Forms

A. Facilities & Services – “Chilled Water Systems & Cooling Towers Draining”

B. Facilities & Services – “Chilled Water Systems & Cooling Towers Cleaning & Flushing”

C. Facilities & Services – “Special Sanitary Sewer Discharge Request”

END OF SECTION 01 74 19

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning activities.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of commissioning process test equipment, instrumentation, and tools.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submittal procedure requirements for commissioning process.
2. Section 01 77 00 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.
3. Section 01 78 23 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal requirements.
4. Section 23 08 00 "Commissioning of HVAC" for technical commissioning requirements for HVAC.
5. Section 26 08 00 "Commissioning of Electrical Systems" for technical commissioning requirements for electrical systems.

1.2 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

B. Basis-of-Design Document: A document prepared by Architect that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Commissioning Authority: An entity engaged by Owner, and identified in Section 01 10 00 "Summary," to evaluate Commissioning-Process Work.

D. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation of commissioning requirements.

E. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's

Project Requirements. The requirements specified here are limited to the construction phase commissioning activities. The scope of the commissioning process is defined in Section 011000 "Summary."

F. Construction-Phase Commissioning-Process Completion: The stage of completion and acceptance of commissioning process when resolution of deficient conditions and issues discovered during commissioning process and retesting until acceptable results are obtained has been accomplished. Owner will establish in writing the date construction-phase commissioning-process completion is achieved. See Section 01 77 00 "Closeout Procedures" for Certificate of Construction-Phase Commissioning Process Completion submittal requirements.

1. Commissioning process is complete when the Work specified of this Section and related Sections has been completed and accepted, including, but not limited to, the following:

a. Completion of tests and acceptance of test results.
b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
c. Comply with requirements in Section 01 79 00 "Demonstration and Training."
d. Completion and acceptance of submittals and reports.

G. Owner's Project Requirements: A document that details the functional requirements of a project and the expectations of how it will be used and operated, including Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is prepared either by the Owner or for the Owner by the Architect or Commissioning Authority.

H. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

I. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

J. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

K. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.3 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 01 33 00 "Submittal Procedures" for submittal procedure general requirements for commissioning process.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors performing the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the Construction Schedule. Comply with requirements in Section 01 32 00 "Construction Progress Documentation" for the Construction Schedule general requirements for commissioning process.
3. Contractor personnel and subcontractors participating in each test.
4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.
3. Calibration record showing the following:

    a. Calibration agency, including name and contact information.
    b. Last date of calibration.
    c. Range of values for which calibration is valid.
    d. Certification of accuracy.
    e. Certification for calibration equipment traceable to NIST.
    f. Due date of the next calibration.

F. Test Reports:

1. Pre-Startup Report: Prior to startup of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issue Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit printout of log of alarms that occurred since the last log was printed.

G. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.4 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction-Phase Commissioning Completion, include the following:

    a. Pre-startup reports.
    b. Approved test procedures
    c. Test data forms, completed and signed.
    d. Progress reports.
    e. Commissioning issue report log.
    f. Commissioning issue reports showing resolution of issues.
    g. Correspondence or other documents related to resolution of issues.
    h. Other reports required by commissioning process.

i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction-Phase Commissioning Completion.
j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction-Phase Commissioning Process Completion.

C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning process shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning process shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
2. Calibrated and certified.

    a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags shall be permanently affixed.
    b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

a. Test specification.
b. Pre-startup reports.
c. Approved test procedures.
d. Test data forms, completed and signed.
e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment if applicable.

1. Service connection requirements, including configuration, size, location, and other pertinent characteristics.
2. Included optional features.
3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness, and lack of damage.

4. Installation Checks:

    a. Location according to Drawings and approved Shop Drawings.
    b. Configuration.
    c. Compliance with manufacturers' written installation instructions.
    d. Attachment to structure.
    e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
    f. Utility connections are of the correct characteristics, as applicable.
    g. Correct labeling and identification.
    h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, at minimum.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

F. Deferred Construction Checklists: Obtain Owner approval of proposed deferral of construction checklists, including proposed schedule of completion of each deferred construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, deferred construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify deferred construction checklists by number and title.
2. Provide a target schedule for completion of deferred construction checklists.
3. Written approval of proposed deferred construction checklists, including approved schedule of completion of each deferred construction checklist.

G. Delayed Construction Checklists: Obtain Owner approval of proposed delayed construction checklists, including proposed schedule of completion of each delayed construction checklist, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. When approved, delayed construction checklists may be completed after date of Construction-Phase Commissioning Completion. Include the following in a request for Certificate of Construction-Phase Commissioning Process Completion:

1. Identify delayed construction checklist by construction checklist number and title.
2. Provide a target schedule for completion of delayed construction checklists.

3. Written approval of proposed delayed construction checklists, including approved schedule of completion of each delayed construction checklist.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning process with the Construction Schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.

1. Where sampling is specified, the sampling plan and procedure for the test demonstration shall be determined using ASQ Z1.4.

    a. General Inspection: Level I.
    b. Acceptance Quality Limit (AQL) of 1.5.

2. The "lot size" in ASQ Z1.4 is the sum of the number of items to which the test demonstration applies, as described in the scope subparagraph of each test.
3. On determination of the sample size, the samples shall be selected randomly by Owner's witness at the time of the test demonstration.
4. Include in the Commissioning Plan a detailed list of the test demonstrations with lot and sample quantities for each test.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning process, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.
2. Obtain, assemble, and submit commissioning documentation.
3. Attend periodic on-site commissioning meetings. Comply with requirements in Section 01 31 00 "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the Construction Schedule. Update Construction Schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.

7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training, and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published Commissioning Schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning process.

C. Construction Checklists:

1. Complete construction checklists as Work is completed.
2. Distribute construction checklists to installing contractors before they start work.
3. Installers:

    a. Verify installation using approved construction checklists as Work proceeds.
    b. Complete and sign construction checklists weekly for work performed during the preceding week.

4. Provide Commissioning Authority access to construction checklists.

D. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

E. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

F. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.

2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
3. Completed test data forms are the official records of the test results.
4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
5. Review preliminary test procedures and test data forms, and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

    a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

G. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

H. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed in this work shall not be used to create the false load without Architect's written approval.

I. Deferred Tests:

1. Deferred Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction-Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction-Phase Commissioning Process Completion as follows:

a. Identify deferred tests by number and title.
b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Delayed Tests:

1. Delayed Test List: Identify, in the request for Certificate of Construction-Phase Commissioning Process Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction-Phase Commissioning Process Completion. Include the following in the request for Certificate of Construction-Phase Commissioning Process Completion:

a. Identify delayed tests by test number and title.
b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to

minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

K. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.
3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within 24 hours of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

    a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
    b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
    c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
    d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

    a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
    b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
    c. Record the results of each step of the diagnostic procedure.
    d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
    e. Determine and record corrective measures.
    f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

    a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
    b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

    a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

    a. Material checks.
    b. Installation checks.
    c. Startup, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
    d. Performance Tests:

        1) Static tests, as appropriate.
        2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
        3) Equipment and assembly performance tests.
        4) System performance tests.
        5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.7 SCHEDULING

A. Commence commissioning process as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning activities into Construction Schedule. See Section 01 32 00 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Construction Schedule and short-interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:

    a. Submittals.
    b. Preliminary operation and maintenance manual submittals.
    c. Installation checks.
    d. Startup, where required.
    e. Performance tests.
    f. Performance test demonstrations.
    g. Commissioning tests.
    h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning process. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short-interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning process.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.8 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

    a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
    b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
    c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
    d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
    e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

    a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
    b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
    c. Signatures of individuals performing and witnessing tests.
    d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issue Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

    a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
    b. Action distribution list.
    c. Report date.
    d. Test number and description.
    e. Equipment identification and location.
    f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
    g. Diagnostic procedure or plan to determine the cause (include in initial submittal)
    h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
    i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.

j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

a. Completed data forms.
b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
c. Activities scheduled but not conducted per schedule.
d. Commissioning compliance issue report log.
e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
b. Attach to the data form printed trend log data collected during the test or test demonstration.
c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.9 CERTIFICATE OF CONSTRUCTION-PHASE COMMISSIONING PROCESS COMPLETION

A. When Contractor considers that construction-phase commissioning process, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning process.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction-phase commissioning process or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction-Phase

Commissioning Process Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction-Phase Commissioning Process Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction-phase commissioning process completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning process. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction-phase commissioning process or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction-Phase Commissioning Process Completion that shall establish the date of completion of construction-phase commissioning process. Certificate of Construction-Phase Commissioning Process Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 01 91 13

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building on-site operations and academic activities are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted and dates of interruption.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
   1. Before selective demolition, Owner will remove the following items:
      a. Laboratory equipment and specimens.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Contractor before start of the Work.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
   1. Hazardous material remediation is specified elsewhere in the Contract Documents.
   2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

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

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video, and templates.
   1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
   2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
   3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

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

B. 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.

C. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

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

END OF SECTION 02 41 19

SECTION 02 82 13 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Work in this Specification must include the provision of all labor, operational equipment, disposal, and incidental materials required to abate asbestos-containing materials (ACM) as indicated on the Drawings and required in this Specification.

1. The Work must be performed as part of the scheduled renovation. All Work must be coordinated so as to not interfere with other renovation trades.

2. The Work must include, but is not limited to the abatement, removal, and disposal of Asbestos Containing Material (ACM) as indicated in the drawings and sheets. Removal of ACM shall be selective and shall be in accordance with the demolition plans based on the locations of the renovations. Removal may include:
   a. ACM flooring including all 12”x12” floor tile, 9”x9” floor tile, linoleum sheet goods and all associated mastics.
   b. ACM miscellaneous materials in the form of drywall and joint compound and transite panels in the laboratory hoods.

3. Based on EDI’s Hazardous material survey, the following suspect materials were reported to contain asbestos:

Material Description	**Material Quantity**	**Material Location**	**Laboratory Results**
12” x 12” Beige Floor Tile	~ 3,400 SF	Room 2161 Throughout Floor	**PC 1.5% - 1.6% Chrysotile**
12” x 12” Beige Floor Tile Black Mastic		Room 2161 Throughout Floor	**PC 1.0% - PC 3.0% Chrysotile**
9” x 9” Beige Floor Tile	~ 300 SF	Room 2161	**None Detected (Considered positive due to the adherence of positive black mastic)**
9” x 9” Black Mastic	~ 300 SF	Room 2161	**PC 1.0% - PC 1.5% Chrysotile**

Material Description	Material Quantity	Material Location	Laboratory Results
White Joint Compound	Throughout	Room 2976 SW, 2161 East	**PC.49% - PC.75% Chrysotile (Composite)**
Vinyl Sheet Goods and Associated Mastic	~ 3,600 SF	Room 2175, 2976	**PC 2.0% Chrysotile**
Transite Panels in Lab Hoods and Associated Ductwork Systems	~400 SF	Throughout Scope of Work Area in Laboratory Fume Hoods and Ducting Systems	**ASSUMED**

***Note C=Chrysotile asbestos**

4. The Contractor must verify all quantities, field conditions, and obstacles to the work in the field before bidding.

5. The Contractor must complete removal and disposal of all ACM components as defined herein, provided in the aforementioned reports, and as shown on the project abatement drawings.

6. The Contractor must provide all labor, operational equipment, and incidental materials required for ACM abatement, removal, and disposal as described in the general specifications and drawings, including all labor, operational equipment, and incidental materials required for pre-cleaning, moving of furnishings, establishing the regulated work area, ACM abatement and disposal shall be included in the base bid.

7. The work will be performed in a fully contained negative pressure work environment unless alternatives are approved by the A&E Design Team and Project Manager (APM).

8. The work must be performed in accordance with applicable local, state and federal regulations. In case of conflict with applicable regulations and/or these specifications, the Contractor shall comply with the most stringent.

9. All quantities provided in the attached reports and herein and on drawing sheets are estimates and shall be field verified by the Contractor prior to bidding. Approximate quantities are provided for information only.
   a. If any additional materials that are homogeneous or similar to the ACM listed herein, as provided in the attached reports or provided on the drawing are identified, the Contractor shall be responsible for the abatement, removal, and disposal of all such materials as ACM inclusive as part of their bid.
   b. If any suspect materials are identified that are not consistent with any ACM identified herein, or in the attached reports, those materials shall be presumed as ACM and the contractor shall be responsible for the abatement, removal, and disposal of all such suspect ACM inclusive as part of their bid.

10. ACM abatement will be conducted inclusive of pipe chases, wall cavities, floor cavities, ceiling cavities and other areas that may require selective demolition to gain access by the Contractor. The Contractor must be responsible for the selective

demolition of ceilings, walls, chases and enclosed areas to provide access for the abatement of ACM in the defined work area.

B. The Contractor must complete preparation of the space to create a contained regulated area for all asbestos abatement activities.

C. The Contractor must remove non salvageable non contaminated materials as shown on the Drawings and required in this Specification.

D. The A&E Design Team will provide the Asbestos Project Manager (APM), as defined by the Illinois Department of Public Health (IDPH) asbestos regulations referenced in this Specification, to provide oversight of abatement during the construction. The A&E Design Team will provide the Asbestos Air Sampling Professional (ASP), as defined by the IDPH asbestos regulations referenced in this Specification, to provide asbestos air sampling during the construction.

E. The A&E Design Team, APM/ASP will provide QA/QC functions including but not limited to the following as needed or requested by the A&E Design Team: review of submittals; review of shop drawings; site evaluation during work area preparation; limited and random site evaluation during work; and, site evaluation and review of final air clearance and release of work areas.

F. The Contractor must also provide all Work in accordance with Specification 01 10 00 - SUMMARY and with Specification 01 12 16 - WORK SEQUENCE.

1.2 RELATED DOCUMENTS

A. Work under this Specification is subject to the requirements of the Contract Documents.

B. A hazardous material survey has been completed to supplement existing information available from TRUMAN COLLEGE in support of the planned renovation activities for the PAR Mechanical room.

C. The Contractor will review the above-referenced reports and abate, remove and dispose all ACM, LBP, and other hazardous and non-hazardous waste materials necessary for the planned renovation work. Abatement will at a minimum comply with this section and all applicable federal, state and local environmental regulations.

1.3 RELATED WORK

A. 01 10 00 - SUMMARY

B. 01 12 16 - WORK SEQUENCE

C. 02 82 13 – ASBESTOS ABATEMENT

D. 02 84 16- HAZARDOUS MATERIALS ABATEMENT

1.4 SUBMITTALS

A. Failure to comply with the submittal requirements will delay the issuance of the "Notice to Proceed" by the A&E Design Team. No extensions will be allowed due to a delay in the issuance of a Proceed Notice caused by failure of the Contractor to submit proper paperwork. Within one calendar week after "Notice of Award", the Contractor must submit to the A&E Design Team:

1. A complete list of all Sub Contractors.

B. At least fourteen calendar days before start of project, the Contractor must submit copies of the following items to the A&E Design Team:

1. A copy of the demolition/renovation notice must be submitted as required by EPA, NESHAPS, 40 CFR 61, Subparts A and M, to the appropriate Federal, State, City or Local air pollution control agency responsible for the enforcement of the National Emission Standard for Asbestos.

2. The Contractor must provide the name, training, qualifications of the competent person, as defined by OSHA, which will be responsible for the work as defined in this Specification.

3. The Contractor must provide a copy of their written personnel protection program, including applicable respiratory protection, fall protection, and other applicable protection requirements that are necessary for the scope of the work provided in this Specification, as required by OSHA.

4. The Contractor must submit for review, shop Drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the Work areas showing location and venting of HEPA units, proposed routing of waste through building and dumpster location as detailed in this Specification and required by applicable regulations.

5. The Contractor must provide a written project schedule and phasing plan as applicable. The schedule must be itemized by containment so as to provide enough information for the A&E Design Team to review and approve/accept the Schedule.

6. When rental equipment is to be used in abatement areas or to transport asbestos contaminated waste, the Contractor must provide a written notification concerning intended use of the rental equipment. The Contractor must provide this to the rental agency.

7. The Contractor must submit copies of notices to police, fire, and emergency medical personnel.

8. The Contractor must submit a copy of Respirator Maintenance Plan required in this Specification. This must also include a copy of Respirator Protection Training and Fit Testing Program.

9. The Contractor must provide documentation that arrangements for the transport and disposal of asbestos-containing or contaminated materials and supplies have been made. The name and location of the disposal site, a copy of handling procedures, and a list of protective equipment utilized for asbestos disposal at the landfill, prepared and signed by the Landfill Operator, must be obtained and submitted.

10. The Contractor must provide documentation from a physician that all employees or agents who may be exposed to airborne asbestos in excess of background levels have been provided with an opportunity to be medically monitored to determine if physically capable of working while wearing the required respiratory equipment without suffering adverse health effects.

11. The Contractor must provide and submit written documentation that personnel have received medical monitoring as required in OSHA 29 CFR and have received medical clearance to wear appropriate personal protective equipment (PPE) including

respirators, which may be required for the work as provided in this Specification. The Contractor must provide information to the examining physician about conditions in the workplace environment (for example, high temperature, humidity, chemical contaminants).

12. The Contractor must provide copies of documentation for all workers and supervisors that will be employed on the project, including the current state licensure and the appropriate current training course accreditation certificate for each employee.

13. The Contractor must provide a list of NIOSH approvals for all respiratory protective devices utilized on site. In addition, manufacturer certification of HEPA filtration capabilities for all cartridges and fibers must be submitted.

14. The Contractor must provide documentation that all of the Contractor's employees and agents who must enter the Work Area have passed respirator fit tests and have been assigned respirators which fit. This fit testing must be in accordance with qualitative procedures as detailed in the OSHA standards.

15. The Contractor must provide manufacturer's certification that HEPA vacuums, negative air pressure equipment, and other local exhaust ventilation equipment conform to ANSI Z 9.2 79.

16. The Contractor must provide Material Safety Data Sheet (MSDS) from supplier or manufacturer for all chemicals proposed for use on project.

17. The Contractor must provide shop Drawings for layout and construction of decontamination enclosure systems and barriers for isolation of the Work area.

C. During abatement activities, the Contractor must submit to the A&E Design Team the following:

1. Weekly (or as otherwise required by the A&E Design Team) job progress reports must include the detailing abatement activities. The progress review must include previously established milestones and schedules, problems and action taken, injury reports, equipment breakdown and bulk material and air sampling results conducted by Contractor's air sampling personnel.

2. Weekly reports must include copies of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the Work area during the abatement process.

3. Daily reports must include copies of Worksite entry logbooks with information on worker and visitor access.

4. Daily logs must include documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.

5. Daily reports must include results of bulk material analysis and air sampling data collected during the course of the abatement including OSHA air monitoring results.

6. Weekly logs must include documentation that each asbestos worker present and in the abatement area was licensed as such by the Illinois Department of Public Health (IDPH).

1.5 REFERENCES

A. Reports summarizing previous environmental studies and tests in the facility are included as attachment to this Specification.

B. The following laws, regulations, and standards are incorporated by reference:

1. 29 CFR 1910.134 -US OSHA Respiratory Protection

2. 29 CFR 1926 - US OSHA Construction Standards

3. 29 CFR 1926.1101 - US OSHA Asbestos Construction Standards

4. 29 CFR 1910.132 - Personal Protective Equipment

5. 29 CFR 1910.20 - Access to Employee Exposure and Medical Records

6. 29 CFR 1910.1200 - Hazard Communication

7. 29 CFR 1910.151 - Medical and First Aid

8. 40 CFR Part 61 - US EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP), 11/90 revision

9. 40 CFR 763 Subpart E - US EPA Asbestos Hazard Emergency Response Act (AHERA) Rules

10. 40 CFR 763 Subpart E, - US EPA Asbestos Model Accreditation Plan Appendix C(MAP): Interim Final Rule

11. 49 CFR 100 185 – Transportation

12. 225 ILCS 207 - Illinois Commercial & Public Building Asbestos Abatement Act

13. 77 Illinois Administrative – Code Part 855, Rules and Regulations

C. If local requirements are more stringent than federal or state standards, the local standards are to be followed.

1.6 DEFINITIONS

A. Definitions included in documents listed in 1.05 REFERENCES, are incorporated into this Specification 02 82 13 ASBESTOS ABATEMENT. Whenever a conflict exists or is discovered, the most protective and stringent definition and rule must apply.

1.7 QUALITY ASSURANCE

A. All Work under this Contract must be done in accordance with applicable Federal, State, County and City regulations, standards and codes governing asbestos abatement and any other trade Work done in conjunction with the abatement.

B. The A&E Design Team will assign an APM/ASP as provided in this Specification, to oversee abatement activities, and collect air samples listed in this Specification 02 82 13 – ASBESTOS ABATEMENT. Additionally, specific air sampling required for OSHA compliance is the responsibility of the Contractor as listed in this Specification 02 82 13 –

ASBESTOS ABATEMENT.

C. The most recent edition of any relevant regulation, standard, document or code must be in effect. Where there is conflict between the requirements or with this Specification, the most stringent requirements must be utilized.

D. The Contractor must ensure compliance with regulations incorporated in 1.05 REFERENCES, and other applicable standards as they are adopted or revised.

E. All laboratory testing services must be in compliance with the IDPH Asbestos Abatement Act and Rules and Regulations. (77 Ill. Adm. Code 855). All project oversight and air sampling will be provided by the A&E Design Team APM/ASP, as specified in this Specification 02 82 13 – ASBESTOS ABATEMENT.

1. The Contractor OSHA compliance air samples must be analyzed by an American Industrial Hygiene Association (AIHA) accredited laboratory which has successfully participated in the NIOSH Proficiency Analytical Testing (PAT) - PAT Program.

2. Clearance air monitoring samples must be analyzed by an American Industrial Hygiene Association (AIHA) accredited laboratory which has successfully participated in the NIOSH Proficiency Analytical Testing (PAT) - PAT Program.

3. Onsite analysis of clearance air samples may be performed in the analyst is proficient in the Asbestos Analyst Registry (AAR).

4. Results of OSHA Compliance air sample analysis must be reported verbally and be followed by a written copy.

    a. Within 24 hours for samples collected during removal must have phase contrast microscopy (PCM) analysis.

5. The final air clearance samples may be analyzed by PCM. The A&E Design Team may provide transmission electron microscopy (TEM) analysis with results within 24 hours for post removal final air clearance samples.

6. The Contractor must be responsible for all personal monitoring as required by OSHA. The Contractor must provide original documents to the A&E Design Team covering the results of the air monitoring. The report must include the following:

    a. Introduction must indicate location of projects, dates, name of Contractor, area size of projects, and identification of monitoring firm.

    b. Summary must briefly state conclusions and findings of study.

    c. Methodology must describe sampling equipment, procedures, and analytical methods used.

    d. Tables must be provided for sample data and calculations.

    e. The original of all reports of Contractor's air monitoring must be signed by the person who conducted the monitoring.

F. Air Monitoring

1. The A&E Design Team APM/ASP will be on site during the duration of the abatement Work. The APM/ASP may be a single person with licensing as both an asbestos

Project Manager and asbestos Air Sampling Professional.

2. The number of daily air monitoring samples during removal or cleaning will be decided by the A&E Design Team APM/ASP based on the size of the abatement activity. The following are required minimum:
   a. A minimum of two area samples inside the contained area.
   b. A minimum of two area samples outside the Work area in uncontaminated areas of the building, including one at the entrance to the worker decontamination enclosure.
   c. A minimum of one area sample at the exhaust of negative pressure ventilation equipment.

3. Removal and/or cleaning activities must be halted when area sample results exceed the following levels:
   a. The sample outside Work area has a total concentration total of 0.01 fibers per cubic centimeter or greater.
   b. The worker time weighed average exposure has a total concentration total of 0.1 fibers per cubic centimeter or greater.

4. All daily air samples will be analyzed by Phase Contrast Microscopy (PCM). Verbal results of daily PCM samples will be available within 24 hours. All results will be followed by a written copy.

G. Clearance air sampling will not begin until the visual inspection is conducted and passed.

1. The A&E Design Team APM/ASP will conduct aggressive air sampling.

2. Clearance air sampling will be conducted in accordance with the IDPH standards.

3. The samples will be analyzed by the PCM or the TEM based on the criteria cited in this Specification.

4. The area will be considered clean if, according to the PCM analysis using NIOSH 7400 procedures, every sample value is at or below 0.01 fibers per cubic centimeter.

5. The area will be considered clean if, according to the TEM, all of the inside Work Area samples are no more than 70 asbestos structures per square millimeter.

6. The same clearance sampling procedures and criteria apply to glovebag/ mini-containment (tent) removal.

7. All cost associated with failure of air clearance sampling are the responsibility of the Contractor, including;
   a. A&E Design Team APM/ASP time and materials for additional site oversight during re-cleaning and additional clearance air sample analysis cost.
   b. A&E Design Team time and expenses for delay in project schedule.

1.8 WARRANTY

A. The Contractor must provide a warranty as required by the Terms and Conditions.

1.9 PROJECT SITE CONDITIONS

A. The A&E Design Team and staff are currently expected to be on premises during abatement Work.

B. No construction traffic must occur through occupied portions of the building and isolation barriers must be provided to secure the Work areas as required in this Specification.

C. No staff or public must enter the Work areas. The Contractor must be responsible to keep the Work areas secure and posted with required warning signs.

1.10 SEQUENCING/SCHEDULING

A. Contractor must provide a written Work schedule for review by the A&E Design Team at least ten working days before commencing Work.

1. The A&E Design Team estimates that the total abatement schedule for materials covered by Specification 02 82 13 must not exceed working days scheduled.

2. Any schedule duration beyond those estimated above must be justified by the Contractor in the Bid for work, including details as to the cause, cost, services that would exceed the estimated schedule and associated cost difference to meet the estimated schedule from the Contractors Bid and associated project schedule.

B. The schedule must be itemized by task and area so as to provide enough information for the A&E Design Team to review the Schedule.

C. The schedule must follow the scheduling as required in Specification 01 10 00 - SUMMARY, and in Specification 01 12 16 - WORK SEQUENCE; and as shown on the Specification Design Drawings.

1.11 EMERGENCY PROCEDURES

A. Emergency planning must be developed prior to abatement initiation and agreed to by Contractor and the A&E Design Team.

B. Emergency procedures must be in written form and prominently posted in the clean change areas and equipment rooms of the worker decontamination areas. Prior to entering the Work area, everyone must read and sign these procedures to acknowledge receipt and understanding of Work site layout, location of emergency exits, and emergency procedures. The Contractor is responsible for establishing and maintaining emergency fire exits from Work areas.

C. Emergency planning must include written notification of police, fire and emergency medical personnel of planned abatement activities, Work schedules and layout of Work areas, particularly barriers that may affect response capabilities and approved means of egress.

D. Emergency planning must include considerations of fire, explosion, toxic atmospheres, electrical hazards, skips, trips and falls, confined spaces and heat related injuries. Written procedures must be developed and employee training in procedures must be provided.

E. Employees must be trained in evacuation procedures in the event of workplace emergencies.

F. For all glove-bag removal, a written contingency plan must be provided to the A&E Design Team that details how an accidental breaking of a glovebag must be cleaned up, decontamination procedures of Work area and workers, and any other pertinent information for the Project.

G. The Contractor must prepare and file a written report immediately following any accident

or emergency. A copy of each report must be issued to the A&E Design Team.

1.12 PROJECT COORDINATION

A. The A&E Design Team will enforce the Contract Documents.

B. The A&E Design Team APM/ASP will tour the Work Area with the Contractor and agree on pre abatement conditions and make a written record of those conditions. Written records must be provided to the A&E Design Team.

C. The A&E Design Team APM/ASP will observe activities at all times during the course of abatement.

D. The A&E Design Team APM/ASP will meet with the Contractor daily to review Work progress and solve problems or adjust procedures as appropriate.

E. The A&E Design Team APM/ASP will provide air sampling, workplace inspections and clearance air test and provide written documentation of such to the A&E Design Team.

F. The A&E Design Team APM/ASP will report on abatement activities to the A&E Design Team.

G. The A&E Design Team APM/ASP will request, review, and maintain a copy of the Contractor submittals. The Contractor must have a complete copy of all submittals on-site at all times for review by the A&E Design Team APM/ASP, the University, and any regulatory agent.

H. The A&E Design Team APM/ASP will have the authority to stop any job activities if they are not performed in accordance with applicable regulations or guidelines, or the requirements of these Contract Documents. These must be reported to the A&E Design Team with description of activity, reason for stopping it and alternatives for correcting the problems.

I. The A&E Design Team APM/ASP will conduct ambient air sampling in accordance with the NIOSH Standard Analytical Method for Asbestos in Air Method 7400 or other acceptable methods, including TEM and will follow all applicable codes and regulations, as outlined herein in this Specification.

J. The number, location, and duration of air samples will be determined by the A&E Design Team APM/ASP, and will be conducted for information only, serving to monitor Contractor performance during the project and will not release the Contractor from any responsibility to conduct personnel air sampling for OSHA compliance.

K. The Contractor must be responsible for daily personnel monitoring as required by OSHA regulations.

L. Project sequence pre abatement meeting must be conducted before start of Work.

M. Removal Work must not commence until the containments are completely constructed, all decontamination areas and equipment are fully in place and operable, and the areas have been inspected and approved by the A&E Design Team and the A&E Design Team APM/ASP.

N. Upon completion of asbestos removal, for each Work area, containments must remain in place, with air filtration systems running, until areas have been inspected, approved by the A&E Design Team APM/ASP and the A&E Design Team and clearance air

monitoring limits and met as described in this Specification.

1.13 TRAINING AND PERSONNEL PROTECTION

A. Prior to commencement of abatement activities, all personnel who must be required to enter the Work areas or handle containerized asbestos containing materials must have valid asbestos worker and/or supervisor licenses issued by the IDPH.

B. Special on-site training on equipment and procedures unique to this job site must be performed as required, such as confined space entry.

C. Training in emergency response and evacuation procedures must be provided to all workers.

D. The Contractor must provide respiratory protection to workers in accordance with a submitted written Respiratory Protection Program and must include all items in OSHA 29 CFR 1910.134. This program must be posted on site. Workers must be provided with personally issued, individually identified (marked with waterproof designations) respirators approved by NIOSH.

E. The minimum respiratory protection requirements during abatement must be established by the Contractor in accordance with their written respiratory program.

1. The Contractor must provide evidence of exposure monitoring and a written exposure assessment to document the use of the respiratory protection selected.

2. At a minimum the contractor must provide half face air purifying respirator equipped with dual HEPA type filters labeled with NIOSH and Mine Safety and Health Administration (MSHA) certification for Work.

3. Workers must perform positive and negative air pressure fit tests each time a respirator is put on, whenever the respirator design so permits.

4. The Contractor’s written documentation will be reviewed by the A&E Design Team.

5. The Contractor must not provide lesser protective alternative respiratory protection for the hazards associated with the work.

6. If at any time the Contractor’s OSHA monitoring shows the need for more protective respiratory protection, the Contractor must provide the more protective respiratory protection immediately and continue use until continued monitoring indicates that less protective respiratory protection use is acceptable based on the assigned protection factor.

F. The Contractor must provide, and workers must be given a qualitative fit test in accordance with procedures detailed in the OSHA Standard 29 CFR for all respirators that must be used on this abatement project.

G. The Contractor must provide documentation of adequate respirator fit and must be provided to the A&E Design Team.

H. The Contractor must provide additional respirators (minimum of 2 of each type), and training on their donning and use must be available at the Work site for authorized visitors who may be required to enter the Work area.

I. The Contractor must provide protective clothing in accordance with OSHA 29 CFR and

the Contractor's written personnel protection program.

J. The Contractor must provide disposable clothing including head, foot, and full body protection in sufficient quantities and adequate sizes for all workers, A&E Design Team APM/ASP, and all authorized visitors by the A&E Design Team.

K. The Contractor must provide hard hats, protective eyewear, gloves, rubber boots, and/or other footwear as required for workers and authorized visitors. Safety shoes may be required for some activities.

L. Non disposable footwear or clothing must remain in the Work area and must be disposed as contaminated material at the end of the Work activities.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. The Contractor must deliver all materials in the original packages, containers or bundles bearing the name of the manufacturer and the brand name (where applicable).

B. The Contractor must provide all equipment and materials completely clean before being brought on the Work site.

C. The Contractor must provide 6 mm Polyethylene sheeting utilized for worker decontamination, opaque white or black in color.

D. The Contractor must provide disposal bags, which must be of 6 mil polyethylene, preprinted with labels as required by EPA regulation 40 CFR 61.152, OSHA requirement 29 CFR 1910.1001 or 29 CFR 1926.1101 with the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE
HAZARD

E. The Contractor must provide warning signs as required by OSHA Final Rules and Standards for 29 CFR Parts 1910.1001 and 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite.

F. The Contractor must provide Material Safety Data Sheet (MSDS) from supplier or manufacturer and are required for all chemicals proposed for use on projects.

G. The Contractor must provide a list of chemicals and products that will be introduced to the work area for review and acceptance by the A&E Design Team, including surfactants, encapsulants, solvents, adhesive, glues, etc., and/or other chemicals that may be used in the abatement. EQUIPMENT

H. The Contractor must provide a sufficient quantity of negative pressure ventilation units equipped with HEPA filtration and operated in accordance with ANSI Z 9.2 79 (Local Exhaust Ventilation requirements) and EPA guidance document EPA 560/5 85 024 Guidance for Controlling Friable Asbestos Containing Materials in Buildings, Appendix J.

I. Recommended Specifications and Operating Procedures for the Use of Negative

Pressure Systems for Asbestos Abatement must be utilized so as to provide one workplace air change every 15 minutes.

J. The Contractor must increase the air change rate to six times an hour (one air change every 10 minutes) if chemical solvents or removers are to be used in the Work area.

1. The total air flow calculations requirement must be total cubic feet per minute equals volume of Work area (in cubic feet) for 15 minutes.

2. The number of units needed for the abatements must be the number of units needed equals total cubic feet times the unit capacity (in cubic feet).

K. Respirators and protective gear must comply with this Specification.

L. The Contractor must provide a sufficient supply of disposable mops, rags and sponges for Work area decontamination.

M. The Contractor must provide a sufficient supply of scaffolds, ladders, lifts, and hand tools (for example, scrapers, wire cutters, brushes, utility knives, wire saws, etc.)

N. The Contractor must provide airless sprayers with pumps capable of providing 125 pounds per square inch at the nozzle tip at a flow rate of 2 gallons per minute for spraying amended water.

O. The Contractor must provide rubber dust pans, and rubber squeegees for cleanup.

P. The Contractor must provide brushes utilized for removing loose asbestos containing material which must have nylon or fiber bristles, not metal.

Q. The Contractor must provide a sufficient supply of HEPA filtered vacuum systems and must be available during cleanup.

PART 3 - EXECUTION

3.1 WORK AREA PREPARATION

A. The Contractor must provide the following full containment measures:

1. The Contractor must have available on sites a list containing the names, addresses, and cellular and office telephone numbers of the Contractor, Supervisor, A&E Design Team and any other personnel who may be required to assist during abatement activities.

2. The Contractor must have available on site a copy of this Specification and Drawings, the IDPH regulations and any other applicable Federal, State, City and Local government regulations.

3. The Contractor must maintain a current and complete copy of all submittals, plans, programs and documentation required by this Specification onsite for the duration of the project.

4. The Contractor must post caution signs meeting the specifications of OSHA’s latest Final Rules and Standards. Signs must be posted to permit a person to read the signs and take the necessary protective measures to avoid exposure before entering

the Work area. Additional signs may need to be posted following construction of workplace enclosure barriers.

5. The Contractor must shut down and lock out electric power to all Work areas. The Contractor must provide temporary power and lighting. The Contractor must ensure safe installation (including ground faulting at the power source) of all temporary power sources and equipment by compliance with all applicable electrical code requirements and OSHA requirements for temporary electrical systems. Electric power source must also be provided, by the Contractor, for the A&E Design Team.

6. The Contractor must seal all air intake and exhaust vents in the Work Area with duct tape and 6 mil polyethylene; must seal any seams in system components that pass through the Work area. The Contractor must remove all HVAC system filters and place in labeled 6 mil polyethylene bags for staging and eventual disposal as asbestos contaminated waste. The Contractor must clean the filter assembly and ductwork using HEPA vacuums or wet cleaning techniques.

7. The University will provide cold water for Work purposes. Contractor must connect to existing water system. Contractor must provide portable water heater for personnel decontamination facility during abatement.

8. The Contractor must pre-clean all movable objects within the Work area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects must be removed from the Work area and carefully stored in an uncontaminated location.

9. The Contractor must pre clean all fixed objects in the Work Area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate. The Contractor must clean machinery behind grills or gratings if contaminated. The Contractor must clean wall, floor and behind fixed items. After pre-cleaning, the Contractor must enclose fixed objects in 6 mil plastic sheeting and seal securely with tape.

10. The Contractor must pre clean all surfaces in the Work area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. It is prohibited to use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. The Contractor must not disturb asbestos containing materials during the pre-cleaning phase.

11. The Contractor must seal all windows, doorways, elevator openings, corridor entrances, drains, ducts, grills, grates, diffusers, skylights and any other penetrations of the Work area (including the outside of the building, tunnels and crawl spaces, if any) with 6 mil polyethylene sheeting and seal with tape. The Contractor must seal all seams in system components that pass through the Work area. Doorways and corridors which must not be used for passage during Work must be sealed with barriers.

12. The Contractor must establish additional work area containment using polyethylene sheeting to protect surfaces that are not scheduled for abatement or removal, and/or that cannot be cleaned.

13. The Contractor must maintain emergency and fire exits from the Work areas or establish alternative exits acceptable to the University and the local fire department requirements.

14. The Contractor must provide an adequate number of portable fire extinguishers of the correct rating per containment.

B. The Contractor must provide Worker Decontamination Enclosure Systems at all locations where workers must enter or exit the Work area. These systems may consist of existing rooms outside of the Work area, if the layout is appropriate, that can be enclosed in plastic sheeting and are accessible from the Work area. When this situation does not exist, enclosure systems may be constructed out of metal, wood or plastic support as appropriate.

1. The Contractor must provide shop Drawings for construction, including materials and layout, submitted as shop Drawings and approved in writing by the A&E Design Team prior to Work initiation. Worker Decontamination Enclosure systems constructed at the Work site must utilize 6 mil opaque black or white polyethylene sheeting or other acceptable materials for privacy. Detailed descriptions of portable, prefabricated units, if used, must be submitted for approval. Submittal must include floor plan with dimensions, materials, size, thickness, plumbing and electrical utilities.

2. The Worker Decontamination Enclosure Systems must consist of at least a Clean Room, a Shower Room, and an Equipment Room. The Worker Decontamination System must be sized to allow entry and exit from the work area containment without unnecessary restrictions.

3. Entry to and exit from all airlocks and Decontamination Enclosure System chambers must be through curtained doorways consisting of three sheets of overlapping polyethylene sheeting. One sheet must be secured at the top and left side, the second sheet at the top and right side and the third sheet must be attached the same as the first.

4. All sheets must have weights attached to the bottom to ensure that they hang straight and maintain a seal over the doorway when not in use. Doorway designs, providing equivalent protection and acceptable to the A&E Design Team may be utilized.

5. Pathways into (from clean to contaminated) and out from (contaminated to clean) the Work area must be clearly designated.

6. Clean Rooms must be sized to adequately accommodate the clothes and equipment of the Work crew.
   a. Benches must be provided as well as hooks for hanging up street clothes. Shelves for storing respirators must also be provided in this Work area.
   b. Clean work clothes (if required under disposables); clean disposable clothing, replacement filters for respirators, towels and other necessary items must be provided in adequate supply in the Clean Room.
   c. A location for postings must also be provided in this Work area.
   d. A lockable door must be used to permit access into the Clean Room from outside the Work area.
   e. Lighting, heat and electricity must be provided as necessary for comfort.
   f. This space must not be used for storage of tools, equipment or materials, or as office space.
   g. The Contractor must provide Shower Rooms at all locations where workers must enter or exit the Work area and must contain one or more showers as necessary to adequately accommodate the workers.
   h. Each showerhead must be supplied with hot and cold water adjustable from inside the shower.
   i. The shower enclosure must be constructed to ensure against leakage of any kind. An adequate supply of soap, shampoo, and towels must be supplied by the Contractor and must be made available at all times.
   j. Shower water must be drained, collected and filtered through a system with at least 5.0-micron particle size collection capability.

k. A system containing a series of several filters with progressively smaller pore sizes must be used to avoid rapid clogging of filtration system by large particles.
l. Filtered wastewater must be discharged to a sanitary sewer.

7. The equipment rooms must be used for storage of equipment and tools at the end of a shift after they have been decontaminated using a HEPA filtered vacuum and/or wet cleaning techniques as appropriate.
   a. Replacement filters (in sealed containers until used) for HEPA vacuums and negative pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement may also be stored here as needed.
   b. A walk off pan (a small children's swimming pool or equivalent) filled with water must be located in the Work area just outside the Equipment Room for workers to clean off foot coverings while leaving the Work area and to prevent excessive contamination of the Worker Decontamination Enclosure System.
   c. A drum lined with a labeled 6 mil polyethylene bag for collection of disposable clothing must be located in this room.
   d. Contaminated footwear (for example, rubber boots, and other reusable footwear) must be stored in this area for reuse.

C. The Contractor must construct waste transfer airlock at some location away from the Worker Decontamination Enclosure System. Wherever possible, this must be located where there is direct access from the Work area to the outside of the building.

1. This airlock system must consist of an airlock, a container staging area and another airlock with access to outside the Work area.

2. The waste transfer airlock must be constructed in similar fashion to the Worker Decontamination Enclosure System using similar materials and airlock and curtain doorway designs. This airlock system must not be used to enter or exit the Work area.

3. The waste transfer airlock must be secured to prevent unauthorized entry.

D. The Contractor must establish emergency exits clearly marked with arrows or other effective designations to permit easy location from anywhere within the Work area. They must be secured to prevent access from uncontaminated areas and still permit emergency exiting. These exits must be properly sealed with polyethylene sheeting that can be cut or otherwise removed to permit egress if needed. These exits may be the Worker Decontamination Enclosure System, the waste transfer airlock and/or other alternative exits satisfactory to fire officials.

E. The Work areas must be separated from (uncontaminated) occupied areas of the building by the construction of barriers in accordance with the requirements of this Specification.

1. Walls must be constructed of 2 inch by 4 inch wood or metal framing to support barriers in all openings larger than 4 foot by 8 foot.

2. Plywood sheeting material must be applied to the Work side of the barrier.

3. Both sides of the partition must be covered with a double layer of 4 mm polyethylene sheeting with staggered joints and sealed in place.

F. Following completion of the construction of all polyethylene barriers and decontamination system enclosures, the Contractor must allow settling to ensure that barriers remain intact and secured to walls and fixtures before beginning actual abatement activities. The

settling time is variable based on the size, extent and type of barriers constructed, but must not be less than a minimum of four hours.

G. The Contractor must provide all polyethylene barriers inside the Work area, in the Worker Decontamination Enclosure System, in the waste transfer airlock and at partitions constructed to isolate the Work area from occupied areas, must be inspected at least twice daily, prior to the start of each day's abatement activities and following the completion of the day's abatement activities.

H. The Contractor must document inspections and observations in the daily project log.

I. The Contractor must repair damage and defects in the enclosure system immediately upon discovery.

J. The Contractor must provide smoke tubes to test the effectiveness of the barrier system before abatement Work begins and at least once a day thereafter until the Work is completed. Results and observations must be documented in the Project logbook.

K. At any time during the abatement activities after barriers have been erected, if visible material or emissions are observed outside of the Work area or if damage occurs to barriers, Work must immediately stop. The Contractor must repair barriers and must clean up debris/residue using appropriate HEPA vacuuming and wet mopping procedures, prior to resuming abatement activities.

L. The A&E Design Team will collect air samples outside of the Work area during abatement activities. If air samples indicate airborne fiber concentrations greater than 0.01 fibers per cubic centimeter or the premeasured background levels (whichever is lower) determined by PCM, Work must immediately stop. The Contractor must inspect and repair barriers, cleanup of surfaces outside of the Work area using HEPA vacuums or wet cleaning techniques prior to resuming abatement activities.

M. The Contractor must install and initiate operation of negative pressure ventilation equipment as needed to provide one air change in the Work area every 15 minutes. If chemical solvents or removers are to be used, the Contractor must provide six air changes per hour in the Work area.

    1. Openings made in the enclosure system to accommodate these units must be made airtight with tape and/or caulking as needed. If more than one unit is installed, they must be turned on one at a time. The Contractor must check the integrity of the wall barriers for secure attachment and must provide, where needed, additional reinforcement.

    2. The Contractor must ensure that adequate power supply is available to satisfy the requirements of the ventilating units.

    3. Negative pressure ventilation units must be exhausted to the outside of the building away from occupied areas.

    4. Twelve-inch diameter extension ducting must be used to reach from the Work area to the outside when required.

N. Careful installation, air monitoring and daily inspections must be done to ensure that the ducting does not release fibers into uncontaminated building areas.

O. The Contractor must operate negative air pressure systems in accordance with Specifications and Operating Procedures for the Use of Negative Pressure Systems for

Asbestos Abatement, Guidance for Controlling Friable Asbestos Containing Materials in Buildings, EPA Report Number 560/5 85 024 (1985).

P. The Contractor must install and initiate operation of pressure differential recorder to verify maintenance of pressure differential of 0.02 inch of water continuously in containment. The Contractor must keep the recorder tape for Project record and provide copies of the recorder tape to A&E Design Team upon request. The A&E Design Team will check the recorder of the manometer on a regular basis during the abatement.

Q. Once constructed and reinforced as necessary, and with negative pressure ventilation units in operation as required, the Contractor must provide test enclosure for leakage utilizing smoke tubes. Repair or reconstruct as needed.

R. The Contractor must clearly identify and maintain emergency and fire exits from the Work area.

S. The Contractor must HEPA vacuum or wet clean the Worker Decontamination Enclosure System and the waste transfer airlock system at the end of each day of abatement activities.

T. The Contractor must not commence Work until:

1. Enclosure systems must be constructed and tested.

2. Negative pressure ventilation systems must be functioning adequately.

3. All pre abatement submissions, notifications, postings, permits bonds, insurance, etc. must be provided and must be satisfactory by the A&E Design Team.

U. The Contractor must remove, clean, replace and enclose plastic in plastic sheeting all ceiling mounted objects such as lights and other items that may interfere with the abatement process and were not previously cleaned and sealed off.

V. The Contractor must utilize localized spraying of amended water and/or HEPA vacuums to reduce fiber dispersal during the removal of these fixtures.

W. If specified procedures cannot be utilized, and/or the Contractor as an alternate procedure that they wish to utilize, the Contractor must make a request, in writing, to the A&E Design Team.

1. Alternative procedures must provide equivalent or greater protection than procedures that they replace.

2. Any alternative procedure must be approved in writing by the A&E Design Team, prior to implementation.

3.2 WORKPLACE ENTRY AND EXIT PROCEDURES

A. All the following procedures must be posted in the Clean Room and Equipment Room by the Contractor. These procedures must be followed throughout the abatement Project until clearance air monitoring has been performed and documented to the satisfaction of the A&E Design Team.

1. All workers and authorized personnel must enter the Work areas through the Worker Decontamination Enclosure Systems.

2. All personnel who enter the Work areas must sign the entry log, located in the Clean Room, upon entry and exit.

3. All personnel, before entering the Work areas, must read and be familiar with all posted regulations, OSHA, EPA - NESHAP and AHERA, IDPH, NIOSH, personal protection requirements (including Workplace entry and exit procedures) and emergency procedures. A sign off sheet must be used to acknowledge that these have been reviewed and understood by all personnel prior to entry.

4. All personnel must proceed first to the Clean Room, remove all street clothes and appropriately don respiratory protection (as deemed adequate for the Project conditions) and launderable and/or disposal coveralls, head covering and foot covering. Hard hats, eye protection and gloves must also be utilized if required. Clean respirators and protective clothing must be provided and utilized by each person for each separate entry into the Work areas.

5. Personnel wearing designated personal protective equipment must proceed from the Clean Room through the Shower Room and Equipment room to the main Work areas.

6. Before leaving the Work area, all personnel must remove gross contamination from the outside of respirators and protective clothing by brushing and/or wet wiping procedures. Small HEPA vacuums with brush attachments may be utilized for this purpose. However, larger machines may tear the suits. Each person must clean bottoms of protective footwear in the walk off pan just prior to entering the equipment room.

7. Personnel must proceed to equipment room where they remove all protective equipment except respirators. The Contractor must deposit disposable clothing into appropriately labeled containers for disposal.

8. Reusable, contaminated footwear must be stored in the Equipment Room when not in use in the Work areas. Upon completion of each abatement, it must be disposed of as asbestos contaminated waste. Rubber boots may be decontaminated at the completion of the abatement for reuse.

9. Those personnel still wearing respirators, must proceed to the shower areas; must clean the outside of the respirators and the exposed face area under running water prior to removal of respirator; and must shower and shampoo to remove residual asbestos contamination.
    a. Various types of respirators may require slight modification of these procedures.
    b. A powered air purifying respirator face piece must be disconnected from the filter/power pack assembly that is not waterproof, upon entering the shower.
    c. A dual cartridge respirator may be worn into the shower.
    d. Cartridges must be replaced for each new entry into the Work area.

10. After showering and drying off, personnel must proceed to the clean room and don clean disposable clothing if there must be later reentry into the Work area or street clothes if it is the end of the Work shift.

11. The Contractor must remove asbestos contaminated waste that has been containerized and must be transported out of Work area through the waste transfer airlock or through the Worker Decontamination Enclosure system if separate airlocks have not been constructed.

12. Waste pass out procedures must utilize two teams of workers, an inside team and an

outside team.

13. The inside team wearing appropriate protective clothing and respirators for inside the Work area must clean the outside, including bottoms, of properly labeled containers (bags, drums, or wrapped components) using HEPA vacuums and wet wiping techniques and transport them into the waste container pass out airlock. No worker from the inside team must further exit the Work area through this airlock.

14. The outside team, wearing a different color protective clothing and appropriately assigned respirators, must enter the airlock from outside the Work area, enclose the drums in clean, labeled, 6 mil polyethylene bags and remove them from the airlock to the outside. No worker from the outside team must further enter the Work area through this airlock.

15. The exit from this airlock must be secured to prevent unauthorized entry.

3.3 RESPIRATOR MAINTENANCE

A. The Contractor must develop a plan for respirator maintenance, covering cleaning procedures, frequency of cleaning, person responsible for cleaning, method and means of storage, location of battery charging station, number of respirators available for use, frequency of cartridge change, compressor placement and length of hose used.

B. The Contractor must submit copy of maintenance plan to the A&E Design Team.

C. The Contractor must submit verification of testing conducted in compliance with ANSI Commodity Specification for Air and OSHA Final Rules and Standards for 29 CFR Parts and 1926.1101 Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite.

D. The Contractor must have available at each Workplace one spare battery pack and cartridge per person per shift.

E. The Contractor must develop emergency procedures as required in this Specification.

F. The Contractor must maintain a log documenting all respirator maintenance procedures.

3.4 ABATEMENT PROCEDURES

A. Prior to gross removal within full containment, the Contractor must clean and isolate the Work area in accordance with this Specification.

1. The Contractor must follow entry and exit procedures in this Specification.

2. Prior to commencement, during and after abatement Work, air monitoring is essential as a means of documenting the air quality throughout the removal project. The Contractor must upgrade workers' respiratory protection or modify removal procedures to reduce airborne fiber concentrations as directed by the A&E Design Team.

3. The Contractor must wet all asbestos containing material with an amended water solution using equipment capable of providing a fine spray mist, in order to reduce airborne fiber concentrations when the material is disturbed. Saturate the material to the substrate; however, must not allow excessive water to accumulate in the Work area.

4. The Contractor must keep all removed material wet enough to prevent fiber release until it can be containerized for disposal. Maintain a high humidity in the Work area by misting or spraying to assist in fiber settling and reduce airborne concentrations. Wetting procedures are not equally effective on all types of asbestos containing materials but must nonetheless be used in all cases.

5. Saturated asbestos containing material must be removed in manageable sections by a 2-person team. Removed material must be containerized before moving to a new location for continuance of the Work. Surrounding areas must be periodically sprayed and maintained in a wet condition until visible material is cleaned up.

6. Material removed from building structures or components must not be dropped or thrown to the floor or ground. Material must be removed as intact sections or components whenever possible and carefully lowered to the floor or ground.

7. Polyethylene bags (6 mil thick) must be sealed when full. ACM must be double bagged when 6 mil polyethylene bags are used for disposal. Bags must not be overfilled. Each bag must be securely sealed to prevent accidental opening and leakage by tying tops of bags in an overhand knot or by taping in goose neck fashion. The bag seal must NOT be with wire or cord. Bags must be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming.

8. Large components removed intact must be wrapped in 2 layers of 6 mil polyethylene sheeting secured with tape for transport to the landfill.

9. Asbestos containing waste with sharp edged components (for example, steel plate, nails, screws) must tear the polyethylene bags and sheeting. These materials must be placed into burlap bags prior to placement in 6 mil polyethylene bags and (drums where required) for disposal.

10. After completion of all stripping Work, surfaces from which asbestos containing materials have been removed must be wet brushed with a nylon brush and sponged or cleaned by an approved equivalent method to remove all visible residue and mastic.

11. Clean up must proceed in accordance with this Specification.

12. After the Work area has been rendered free of visible residues and inspected by the A&E Design Team, the Contractor must apply a thin coat of an encapsulating agent approved by the A&E Design Team to all surfaces.

B. The Contractor must encapsulate the asbestos containing materials in accordance with the following procedures:

1. The Contractor must field test encapsulants prior to use by applying each to a small area to determine suitability for the materials to be encapsulated.

2. Encapsulants must be applied using airless spray equipment, after gross removal is complete and the area is rendered free of visible residue.

3.5 CLEANUP PROCEDURES

A. The Contractor must remove all visible accumulation of asbestos containing materials and asbestos contaminated debris utilizing rubber dust pans and rubber squeegees to move materials around. The Contractor must NOT use metal brushes or shovels to pick up or move accumulated waste. Special care must be taken to minimize damage to floor

finishes.

B. The Contractor must wet clean all surfaces in the Work area using rags, mops and sponges as appropriate. Excess water and wet debris may be picked up with a wet dry shop vacuum.

C. Residual water must be vacuumed with the HEPA filtered vacuum. This water must be filtered to 5 micrometers prior to disposal in municipal sewer.

D. The Contractor must remove at the minimum on a daily basis all containerized waste from the Work area and waste container pass out airlock.

E. The area must be inspected and approved by the A&E Design Team.

F. The Contractor must remove the cleaned plastic sheeting from walls and floors, as applicable. Windows, doors, HVAC system vents and all other openings must remain sealed. The negative pressure ventilation units must remain in continuous operation. Decontamination enclosure systems must remain in place and be utilized.

G. After cleaning of the Work area, the Contractor must wait at least 4 hours to allow fibers to settle. The windows, doors, HVAC system vents and all other openings must remain sealed.

H. The Contractor must decontaminate all tools and equipment and remove at the appropriate time in the cleaning sequence.

I. The A&E Design Team APM/ASP will inspect the Work area for visible residue by wiping surfaces with a dark cloth. If any accumulation of residue is observed by the A&E Design Team APM/ASP, it must be assumed to be asbestos and the cleaning/settling period cycle must be repeated.

J. The Contractor must encapsulate the areas from which asbestos has been removed.

K. Once the Work area has passed the final visual inspection, clearance air monitoring will be conducted by the A&E Design Team in accordance with this Specification. A minimum of 4 hours after final cleaning must be allowed, prior to start of air sampling. The air in the Work area must be agitated during the air monitoring. If the acceptable air quality concentrations are met, barriers may be removed and properly disposed of.

L. A final inspection must be conducted by the A&E Design Team to assure that no contamination remains in the Work area.

M. All additional cleaning required must be provided at no cost to the University as outlined herein in this Specification, until the cleanup criteria has been met.

N. The HEPA units must remain in operation until final clean check criteria have been met.

3.6 DISPOSAL

A. The Contractor must remove all asbestos containing and contaminated materials from the Work area must occur as a minimum once daily. None of these materials must remain on site overnight but rather be placed in the required lockable dumpster.

B. As the Work progresses, to prevent exceeding available storage capacity on site, sealed and labeled containers of asbestos containing waste must be removed and transported to the prearranged disposal location.

C. Disposal must occur at an authorized site in accordance with regulatory requirements of NESHAP and applicable Federal, State, County, City and other Local guidelines and regulations.

D. All dump receipts, trip tickets, transportation manifests and/or other documentation of disposal must be delivered to the A&E Design Team for their records.

1. A recommended record keeping format utilizes a chain of custody form which must include the names and addresses of the A&E Design Team, Contractor, pickup site, and disposal site, the estimated quantity of the asbestos waste and the type and number of containers used.

2. The form must be signed by the Contractor, A&E Design Team and the Disposal Site Operator, as the responsibility of the material changes hands.

3. If a separate hauler is employed, the name, address, telephone number and signature must also appear on the form.

E. Once bags and wrapped components have been removed from the Work area, they must be loaded into an enclosed lockable waste dumpster. Waste dumpsters must be locked when unattended.

1. When moving containers, utilize hand trucks, carts and proper lifting techniques to avoid back injuries. Trucks with lift gates are helpful for raising drums during truck loading.

2. The enclosed area of the waste dumpster must be free of debris and lined with 6 mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting must be installed first and extend up the side walls. Wall sheeting must overlap floor sheeting by six inches and taped into place.

3. Personnel loading asbestos containing waste must be protected by disposable clothing including head, body and foot protection and at a minimum, half face piece, air purifying, dual cartridge respirators equipped with HEPA filters.

4. Any debris or residue observed on containers or surfaces outside of the Work area resulting from cleanup or disposal activities must be immediately cleaned up using HEPA filters vacuum equipment and/or wet methods as appropriate.

5. Dumpsters used for asbestos waste disposal must have metal doors and metal tops that can be closed and locked to prevent vandalism, wind dispersion of asbestos fibers, or other disturbances of bagged asbestos debris. Unbagged material must not be placed in these containers, nor must it be used for non-asbestos waste. Bags must be placed, not thrown, into these containers.

6. Asbestos containing materials must be transported directly to the landfill from the project site. Temporary storage or waste staging at an alternative site is not permitted.

F. Upon reaching the landfill, waste shall be off-loaded in accordance with applicable EPA waste disposal requirements.

1. All signed waste shipment records must be submitted to the A&E Design Team within 30 days after waste shipment from the job site.

3.7 RE ESTABLISHMENT OF THE WORK AREA AND SYSTEMS

A. The Contractor must reestablish the Work area only following the completion of cleanup procedures and passing clearance air testing by TEM or PCM in accordance with this Specification.

B. Following satisfactory clearance air monitoring of the Work areas, remaining polyethylene barriers and worker and equipment decontamination enclosure systems must be removed and disposed of as asbestos contaminated waste. Following removal, the entire Work area, including HVAC filter assembly and ductwork must be wet cleaned or HEPA vacuumed to remove residual asbestos fibers.

C. The Contractor must reinstall mounted objects removed from their former positions during Work area preparation activities, as applicable.

D. The Contractor must relocate objects that were removed to temporary locations back to their original positions, as applicable.

E. The Contractor must reestablish HVAC, mechanical and electrical systems in proper working order after receiving written approval from the A&E Design Team, as applicable.

F. The Contractor must repair all areas of damage that occurred as a result of abatement activities, as applicable.

3.8 GLOVEBAG REMOVAL/MINI CONTAINMENT (TENT)

A. Air monitoring must be performed in accordance with this Specification.

1. The Contractor must shut down the electric power to the abatement areas. The Contractor must provide temporary power and lighting. The Contractor must ensure safe installation (including ground faulting) of temporary power sources and equipment by compliance with all applicable Electrical Code requirements and OSHA requirements for temporary electrical systems.

2. The Contractor must bring all necessary tools and materials into the mini containment (Tent) Work area before the glovebag removal procedure begins.

3. The Contractor must clean all visible debris on the floor or other surfaces in the Work areas by HEPA vacuuming and wet cleaning methods.

4. The Contractor must contain the Work area in which removal must be performed.
   a. The Contractor must shut down the Work area HVAC system and seal all openings.
   b. The Contractor must erect a mini containment (tent) consisting of one layer of 6 mil polyethylene. This mini containment (tent) must include a ceiling, walls and a floor.
   c. The Contractor must provide an airlock with polyethylene sheeting curtained doorway at access doors.
   d. The Contractor must provide a negative pressure atmosphere within the Work area.

5. The Contractor must provide decontamination facilities consisting of at least one clean room, shower room and equipment room within reasonable proximity to all Work areas but within the Work area enclosed by each "Type A" barrier. Location must be approved by the A&E Design Team. The equipment room must be under negative air pressure for the entire duration of the Work.

6. The Contractor must provide a waste transfer airlock.

7. The Contractor must maintain emergency and fire exits from the Work area. Fire extinguishers must be in close proximity to each tent.

8. The Contractor's personnel must be provided with two disposable suits to wear during abatement Work.

B. Mini containment (tent) removal procedures must be done by a minimum of two licensed asbestos workers trained in mini containment (tent) procedures and equipped with full personnel protective equipment in accordance with ILL. 855.480.

C. If any insulation is severely damaged, either at or remote from the section of insulation being removed, the Contractor must wrap the entire portion of insulation in polyethylene and secure with duct tape, spiraling the length and must provide a shroud around the damaged area.

1. Insulation adjacent to that being removed must be wrapped in 6 mil polyethylene sheeting and sealed airtight with duct tape.

2. The Contractor must wrap one layer of duct tape around the pipe/fitting/duct at each location where the glovebag must be attached.

3. The pipe/fitting/duct insulation diameter must not exceed one half the glove bag above the attached gloves.

4. The Contractor must open the bag; must place tools inside; must wrap glovebag around pipe/fitting/duct; and must seal the top with staples and duct tape. The glovebag must be attached securely around the insulation, forming a smooth airtight seal.

5. The Contractor must tape the ends of the glovebag to the pipe. When removing from vertical piping/fitting/duct, special care must be taken to assure that the lower end of the glovebag is securely sealed against the pipe to ensure the glove bag remains airtight, thus no leakage.

6. The Contractor must reinforce bottom of bag; make two folds (approximately one inch each); and must secure with duct tape.

7. The Contractor must tape the wand from the water sprayer to the water sleeve.

8. The Contractor must tape hose of HEPA vacuum to mini containment (tent) space.

9. The Contractor must set up a chain of glovebags within the Work area prior to requesting the A&E Design Team's inspection. The A&E Design Team will not inspect the glovebags one at a time. The A&E Design Team will issue a warning notice or stop Work if abatement starts without A&E Design Team's inspection, testing and approval of glovebag setup.

10. Each glovebag must be visually and smoke tube tested for air tightness by the A&E Design Team prior to asbestos removal. Any leakage points must be taped airtight, and a retest must occur.

D. Where damaged insulation is laying on ceiling or floor, all surfaces must be HEPA vacuumed prior to starting removal procedures. The Contractor must remove small amount of pipe/fitting/duct insulation in a mini containment (tent).

1. The Contractor must spray all tools with water and place in pouch.

2. The asbestos containing insulation within the secured glovebag must be wetted with amended water prior to stripping.

3. The Contractor must cut the ends of the insulation and slit lengthwise. The Contractor must constantly mist the asbestos material with amended water during cutting and removal.

4. The Contractor must remove insulation.

5. The Contractor must deposit the waste in the bottom of the glovebag.

6. The Contractor must spray unprotected pipe with amended water, scrub and wipe down exposed pipe/fitting/duct to remove all visible ACM.

7. The Contractor must seal the exposed ends of insulation with encapsulant prior to detaching the glovebag.

8. The pipe/fitting/duct, the interior of the bag, the insulation, and the tools must be sprayed with amended water. The enclosed atmosphere must be misted, and time allowed for the mist to settle.

9. The glovebag must not be shifted down a pipe or duct, nor must it be moved from the initial pipe or duct to another.

10. The Contractor must isolate tools in the glovebag gloves, thus turning the gloves inside out, forming a new pouch, twist and seal with duct tape, sever at mid seal forming two separate bags.

11. The Contractor must collapse the glovebag using HEPA filtered vacuum.

12. The Contractor must twist glovebag several times and seal with duct tape.

13. The Contractor must slip a 6-mil polyethylene disposal bag over the glovebag while it is still attached to pipe/fitting/duct. The Contractor must remove the tape; must open the top of the glovebag; and must fold it down into the disposable bag.

14. The Contractor must twist, seal and label the disposal bag.

15. The Contractor must clean the bag with a damp cloth.

16. The Contractor must dispose of all material, rags, brushes, etc. as asbestos contaminated waste.

17. The Contractor must follow waste container pass out procedures.

18. After removal is finished, the Contractor must wet wipe and HEPA vacuum the Work area.

19. Once removal Work begins, all workers leaving the Work area must be decontaminated by having their outer suit thoroughly HEPA vacuumed.

20. The Contractor must proceed into airlock and remove and place outer suit in drum lined with a 6-mil polyethylene bag for disposal.

21. All workers must proceed immediately to the shower area, with respirators still on and must perform complete decontamination.

22. The Workplace entry and exit procedures must be posted in the clean room and equipment room.

E. Emergency Procedures.

1. In the event of the glovebag rupturing or melting, the device and shroud must be immediately cleaned with wet cloths and HEPA vacuuming.

2. The broken glovebag must be encased in a new glovebag and attached as specified in the above paragraphs.

3. Workers contaminated by asbestos material must follow Worker Decontamination Procedures as previously specified.

F. The Contractor must remove and containerize all visible accumulation of asbestos containing materials and asbestos contaminated debris utilizing rubber dust pans and rubber squeegees to move materials around. The Contractor must NOT use metal shovels to pick up or move accumulated waste.

G. The Contractor must wet clean all surfaces in the Work area using rags, mops and sponges as appropriate.

H. The Contractor must encapsulate the Work areas from which asbestos has been removed.

I. The Contractor must remove all containerized waste from the Work area.

J. The Work area must be inspected and approved by the A&E Design Team.

K. The Contractor must decontaminate all tools and equipment and must remove them at the appropriate time in the cleaning sequence.

L. The Contractor must inspect the Work area for visible residue. If any accumulation of residue is observed by the A&E Design Team, it must be assumed to be asbestos, and the cleaning cycle must be repeated.

M. Following completion of removal and clean ups, all shrouds (including tent) must remain sealed until clearance air monitoring is complete and the results acceptable.

N. Aggressive air sampling methods must be utilized for all clearance air monitoring unless directed otherwise by the A&E Design Team.

O. The Contractor must remove all debris and materials that are left over and leave the area in the "clean" state.

P. The Contractor must restore all Work areas to their original condition.

Q. Contractor is responsible for all damage caused by or during the abatement process. Contractor must make every effort to rectify the damaged areas to their original condition subject to approval by the A&E Design Team and the A&E Design Team.

R. Disposal procedures must comply with this Specification.

S. Re-establishment of the Work area and systems must comply with this Specification.

END OF SECTION 02 82 13

SECTION 02 84 16 - HAZARDOUS MATERIALS ABATEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Work in this Specification must include the provision of all labor, operational equipment, disposal, and incidental materials required to test, classify, segregate, package, remove, transport, and dispose of hazardous materials as indicated on the Drawings and required in this Specification.

1. The Work must be performed as part of the scheduled renovation. The work area is not scheduled to be occupied and operational as a college classroom setting during the renovation. All work must be coordinated so as to not interfere with other renovation trades.

B. The Work must include, but is not limited to the testing, classification, segregation, packaging, removal, transport, and disposal of hazardous materials as indicated on Drawings and as required by this Specification.

C. The Work must include, but is not limited to the abatement, testing, removal, and disposal of the following categories and example materials:

1. Fluorescent light ballasts;

2. Other potentially hazardous special use lighting;

3. Chemical Fume Hoods and associated exhaust ducting/piping
    a. The abatement contractor should note that chemical fume hoods and associated ductwork may have been used with a multitude of known and unknown chemicals. The hoods are located in the scope of work area. The contractor shall decommission, decontaminate, abate, remove and dispose of all existing laboratory hoods including duct systems, fans, exhaust stacks, and any other components associated with the hoods that may have been impacted by chemicals in coordination with the college facilities and services in accordance with the specifications

4. Sink traps and sink separators/collectors associated with chemical drains. The Contractor shall abate, remove and dispose of all existing sink traps and trap separators in place. All waste shall be collected, tested and disposed of by the contractor in accordance with the specifications.

Estimates of the hazardous materials are identified below. A hazardous material survey has been completed to supplement existing information available from Harry S. Truman College in support of the planned renovation activities for the 2nd floor Biology Labs Renovation – A copy of the report titled, *"Summary of Findings –City Colleges of Chicago, HARRY S. TRUMAN COLLEGE; 1145 West Wilson, Chicago IL 60640,"* is provided as an attachment to this specification as reference.

Universal Waste Material	**Estimated Amount Based on Discovered Amount During Design**
Fluorescent Light Ballasts	100
Fluorescent Light Bulbs	200
Other Lighting	10
Thermostats	5
Mercury Switches	0
Electric Transformers	0
Misc. Valves/Gauges (Mercury)	0
Air-Conditioning Units	0
Batteries	0
Sink Traps/Separators	Unable to quantify
Compressors, oils, switches	0
Chemical Hoods and associated ducting– with potential chemical impact	Work is inclusive of the hoods, duct systems, fans, exhaust stacks, and any other components associated with the hoods that may have been impacted by unknown chemicals

D. The estimates provided above are field visual estimates based on accessible spaces. Quantities are provided only for representation of what was visually identified during the survey and may not be inclusive off all materials present within the space. The Contractor must verify all quantities, field conditions, and obstacles to the work in the field before bidding, and provide estimates based on the field conditions inclusive of materials present in the field before bidding.

E. The Contractor must complete removal and disposal of all universal waste components as defined herein, provided in the aforementioned reports, and as shown on the project abatement drawings, inclusive of actual field conditions.

F. The Contractor must remove and dispose of certain items such as equipment containing polychlorinated biphenyls (PCBs), fluorescent / HID lights, lighting ballasts, laboratory hoods and associated ducting.

1. The Contractor must provide all labor, operational equipment, and incidental materials required for universal waste abatement, removal, and disposal as described in the general specifications and drawings, including all labor, operational equipment, and incidental materials required for pre-cleaning, moving of furnishings, establishing the regulated work area, abatement and disposal shall be included in the base bid.

A. The College will assign a Construction Manager (CM) for coordination of work with the PSC and the Contractor.

B. The Contractor must coordinate work with the CM.

C. The Professional Service Consultant (PSC) will review all submittals and documents required in these Specifications. All submittals and documents must be submitted to the PSC

G. The Contractor must complete preparation of the space to create a regulated area for all abatement activities.

H. The Contractor must remove non salvageable non contaminated materials as shown on the Drawings and required in this Specification.

I. The Contractor must clean and salvage the contaminated materials and areas.

J. The Contractor must restore the Work site to its preconstruction condition. The Contractor must repair or replace all affected materials, finishes, equipment, etc., which were damaged, affected, or otherwise changed in a manner not in accordance with these Specifications during the course of the Work.

K. The Contractor must be responsible for determining if any material, finishes, equipment, etc., are in good condition prior to commencing the Work. These items must be noted and put into record by the Contractor no fewer than ten (10) calendar days before commencing Work, with a copy submitted to the PSC

L. The PSC will provide an environmental consultant (EC) to evaluate the work progress of the Contractor and to provide onsite oversight during abatement to assurance compliance with this Specification and the applicable regulations.

M. The PSC will provide QA/QC functions including but not limited to the following as needed or requested by the PSC: review of submittals; review of shop drawings; site evaluation during work area preparation; limited and random site evaluation during work;

and, site evaluation and review of final clearance and release of work areas.

1.2 RELATED WORK

A. SECTION 01 10 00 – PROJECT SUMMARY

B. SECTION 02 41 00 – DEMOLITION

C. SECTION 02 41 13 – SELECTIVE SITE DEMOLITION

D. SECTION 02 82 13 - ASBESTOS ABATEMENT

1.3 RELATED DOCUMENTS

A. Work under this Specification is subject to the requirements of the Contract Documents.

1.4 SUBMITTALS

A. The Contractor must provide the following submittals to the PSC prior to starting removal activities Work.

1. The Contractor must submit for approval a schedule of activities, including sampling (if necessary), containment of hazardous material, transporter, and disposal facility.

2. The Contractor must submit for approval a schedule of salvage inventory plan, transporter, and storage facility or recipient.

3. The Contractor must submit for approval an inventory of hazardous materials and methods of disposal for each material.

4. The Contractor must submit applications and obtain proper permitting for disposal from the appropriate disposal facility for categorized hazardous waste.

5. The Contractor must provide copies of all permits and approvals for record.

6. The Contractor must submit for review, the names and resumes of Contractor and Subcontractor personnel that are to perform the removal Work. The Contractor must submit activities of subcontractors and subcontractor information. Resumes must identify personnel qualifications to perform the methods, protocols, and procedures for the Work. Proof of OSHA training must be in compliance with the Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) for applicable workers.
   a. The contractor must submit specific training and experience, including key personnel qualifications, in recognizing, assessing, desensitizing, decontaminating, characterizing and packaging for the disposal of energetic materials including perchlorates.

7. The Contractor must submit for approval a site-specific Health and Safety Plan (HASP) for removal Work.

D. The Contractor must provide the following submittals to the PSC after completion of the removal Work.

1. The Contractor must submit disposal records. All records must be tracked in accordance with regulatory requirements.

a. Copies of all daily reports must include transport records, and disposal receipts.
b. Bills of sale must be for all materials sold as scrap or salvage.
c. Log must include materials retained by Contractor.
d. All waste disposal certificates and manifest shall be executed and signed by an authorized College Representative, prior to any waste leaving the project site. The Contractor shall coordinate all waste removal from the site with the CM for execution and signature on any waste manifest, and/or waste disposal certificate.
e. All waste that departs the site shall be delivered DIRECTLY to an approved landfill, disposal and/or recycling facility and shall not be stockpiled off-site or co-mingled with waste streams from other projects.
f. All manifests must include waste disposal and measured waste tickets, as appropriate, of all materials removed.

2. The Contractor must submit Certificates of Disposal from the disposal facilities.

3. The Contractor must submit salvage records. All records must be tracked in accordance with regulatory requirements.
   a. Copies of all daily reports and transport records must be provided.
   b. Receipts for all salvaged equipment must be provided.

1.5 REFERENCES

A. Illinois, Title 35

1. Part 721.103: Definition of Hazardous Waste

2. Part 808: Special Waste Classifications

3. Part 809: Nonhazardous Special Waste Hauling and the Uniform Program

B. Occupational Safety and Health Administration (OSHA)

1. 29 CFR 1910.120. Hazardous Waste Operations and Emergency Response (HAZWOPER).

C. US Department of Transportation

1. 49 CFR Parts 171-177: Hazardous Materials Regulations

D. U.S. Environmental Protection Agency (USEPA)

1. 40 CFR 261: Identification and Listing of Hazardous Waste.

2. 40 CFR 268 Land Disposal Restrictions

3. 40 CFR 761: PCBs Manufacturing, Processing, Distribution in Commerce, and Use Prohibition

4. TSCA regulations

1.6 QUALITY ASSURANCE

A. Requirements of regulatory agencies must be adhered to during handling, transport, and/or disposal of hazardous or suspect hazardous materials.

B. Governing regulatory agencies include IDOT (hazardous materials transport rules), IEPA,

other state, federal and local regulations governing hazardous materials.

C. Contractor must meet transporter regulations and arrange permitting for disposal facilities, respective to hazardous materials to be disposed or transported for salvage.

1. Contractor's disposal plan for all materials must be outlined and submitted for review, including materials to be disposed, packing materials, estimated quantities, transport, and disposal facility certifications. Plan for salvage, removal and storage of medical equipment must also be outlined and submitted for review.

2. Contractor must show applicable certifications and record of previous job performance.

1.7 WARRANTY

A. The Contractor must provide a warranty as required by the Terms and Conditions.

1.8 PROJECT SITE CONDITIONS

A. The College will assign a Construction Manager (CM) for coordination of work with the PSC and the Contractor

B. The PSC and staff are currently expected to be on premises during Work.

C. No staff or public must enter the regulated Work areas. The Contractor must be responsible to keep the regulated Work areas secure and posted with required warning signs.

1.9 SEQUENCING/SCHEDULING

A. The Contractor must provide a written project schedule and phasing plan as applicable. The schedule must be itemized by containment so as to provide enough information for the PSC to review and approve/accept the Schedule.

1. The PSC estimates that the total abatement schedule for materials covered by Specification 02 82 13, and 02 84 16 must not exceed scheduled working days.

2. Any schedule duration beyond those estimated above must be justified by the Contractor in the Bid for work, including details as to the cause, cost, services that would exceed the estimated schedule and associated cost difference to meet the estimated schedule from the Contractors Bid and associated project schedule.

1.10 EMERGENCY PROCEDURES

A. Emergency planning must be developed prior to Work initiation and agreed to by Contractor and the PSC

B. Emergency procedures must be in written form and prominently posted at the access points to the regulated areas. The Contractor is responsible for establishing and maintaining emergency fire exits from regulated Work areas.

C. Emergency planning must include written notification of police, fire and emergency medical personnel of planned abatement activities, Work schedules and layout of Work areas, particularly barriers that may affect response capabilities and approved means of egress.

D. Emergency planning must include considerations of fire, explosion, toxic atmospheres,

electrical hazards, skips, trips and falls, confined spaces and heat related injuries. Written procedures must be developed and employee training in procedures must be provided.

E. Employees must be trained in evacuation procedures in the event of workplace emergencies.

F. The Contractor must prepare and file a written report immediately following any accident or emergency. A copy of each report must be issued to the PSC

1.11 PROJECT COORDINATION

A. The College will assign a Construction Manager (CM) for coordination of work with the PSC and the Contractor.

B. The PSC will enforce the Contract Documents.

C. The PSC Environmental Consultant (EC) will tour the Work Area with the Contractor and agree on pre abatement conditions and make a written record of those conditions. Written record must be provided to the PSC

D. The PSC EC will observe activities at all times during the course of abatement.

E. The PSC EC will meet with the Contractor daily to review Work progress and solve problems or adjust procedures as appropriate.

F. The PSC EC will ensure performance of sampling, workplace inspections and clearance assessment/testing and provide written documentation of such to the PSC

G. The PSC EC will report on abatement activities to the PSC

H. The PSC EC will request, review, and maintain Contractor submittals.

I. The PSC EC will have the authority to stop any job activities if they are not performed in accordance with applicable regulations or guidelines, or the requirements of these Contract Documents. These must be reported to the PSC with description of activity, reason for stopping it and alternatives for correcting the problems.

J. The Contractor must be responsible for personnel monitoring as required by OSHA regulations.

K. Project sequence pre abatement meeting must be conducted before start of Work.

L. Removal Work must not commence until the regulated areas are completely constructed, all decontamination areas and equipment are fully in place and operable, and the areas have been inspected and approved by the PSC EC and provided in writing to the PSC.

M. Upon completion of Work, for each regulated Work area, regulated Work areas must remain in place until areas have been inspected, approved by the PSC EC and clearance monitoring is complete and written results have been provided to the PSC.

1.12 TRAINING AND PERSONNEL PROTECTION

A. Prior to commencement of Work activities, all personnel who must be required to enter the regulated Work areas or handle hazardous materials must have training and medical surveillance as required by OSHA regulations and this Specification.

1. The contractor must submit specific training and experience, including key personnel qualifications, in recognizing, assessing, desensitizing, decontaminating, characterizing and packaging for the disposal of energetic materials including perchlorates.

B. Special on-site training on equipment and procedures unique to this job site must be performed as required, such as confined space entry.

C. Training in emergency response and evacuation procedures must be provided to all workers.

D. The Contractor must provide respiratory protection to workers in accordance with a submitted written Respiratory Protection Program, and must include all items in OSHA 29 CFR 1910.134. This program must be posted on site. Workers must be provided with personally issued, individually identified (marked with waterproof designations) respirators approved by NIOSH.

E. The Contractor must provide protective clothing in accordance with OSHA 29 CFR and the Contractor's written personnel protection program.

F. The Contractor must provide disposable clothing including head, foot, and full body protection in sufficient quantities and adequate sizes for all workers, PSC and all authorized visitors by the Contractor.

G. The Contractor must provide hard hats, protective eyewear, gloves, rubber boots, and/or other footwear as required for workers and authorized visitors. Safety shoes may be required for some activities.

H. Non disposable footwear or clothing must remain in the Work area and must be disposed as contaminated material at the end of the Work activities.

2 PART 2 - PRODUCTS

2.1 MATERIALS

A. Contractor must provide all materials, equipment, supplies, and other necessary items to complete the safe and contained removal, transport, and disposal of hazardous materials. It is the Contractor's responsibility to acquaint and satisfy themselves as to the nature and material of the Work and general conditions. Any failure by the Contractor to acquaint themselves with all available information must not relieve the Contractor of responsibility for properly estimating the difficulty or cost of successfully performing the Work.

B. The Contractor must provide and maintain an adequate safety zone to secure the site Work area during handling and removal of materials from the Project site.

C. Packing materials must be used to safely containerize materials for transport and safe disposal in accordance with all applicable regulations per each type of hazardous material. Hazardous materials must be properly removed. Packing materials must meet or exceed the requirements of applicable governing agencies or approving bodies.

D. Any leaking materials or compromised containers are the Contractors responsibility to address for packing, cleanup, and on site impacts.

E. The Contractor must provide the necessary safety equipment for protection of personnel to conduct Work under safe conditions and in accordance with applicable OSHA requirements regarding removal, transport, and disposal of hazardous materials.

F. No fire or open flame must be allowed in the Work area at any time. Smoking must not be allowed in Work areas.

G. All materials must be contained on site prior to transport and may require over pack materials or other containment.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contactor must supply all materials, equipment, labor and supervision necessary to complete the removal, transport and disposal.

B. The Contractor shall abate, remove and dispose of all existing sink traps and trap separators in place. All waste shall be collected, tested and disposed of by the contractor in accordance with the specifications.

C. The Laboratory Hoods and associated exhaust ducting have been used over the years for a multitude of known and unknown chemical agents and must be handled as Hazardous Waste. The contractor shall decommission, decontaminate, abate, remove and dispose of all existing laboratory hoods including duct systems, fans, exhaust stacks, and any other components associated with the hoods that may have been impacted by chemicals in coordination with the college facilities and services in accordance with the specifications.

D. All Work must be in accordance with all applicable federal, state, and local requirements and regulations. In the event that state or local regulations exceed the requirements of this Specification, the regulation must take precedence.

E. The Contractor must be responsible for and obtain at their own expense: disposal permits and other necessary permits, equipment registrations, operating certificates, and any other document required by applicable codes, regulations, and laws.

F. Omissions from this Specification that are necessary to carry out the intent of the Project, or omissions which are customarily performed, must not relieve the Contractor from performing such omitted details of the Work, but they must be performed as if fully and correctly set forth and described in this Specification.

G. The Contractor must conduct the Work so that operations of facilities must not be disturbed at any time during the Project.

1. The Contractor must perform all Work within the permissible noise levels, day of week, and hour of day limitations, and within the guidelines established by applicable federal, state, and municipal codes, regulations, laws, and standards.

2. The Contractor must use prevention techniques to prevent the generation of fumes, dust, and environmental disruption in order to prevent any health hazards to nearby occupants.

H. The Contractor must have a superintendent available to respond to the job site from telephone or in person immediately, upon request.

I. Before starting any Work, the Contractor must meet with the PSC to discuss all phases of Work to be performed.

1. At these meetings, an order of procedure must be established and documented that must be mutually satisfactory to the PSC and Contractor.

1. Hazardous materials handling protocols must be defined in detail and must become part of the Contractor's standard operating procedures (SOPs) throughout all project operations.

2. No deviation from this established order of procedures must be permitted unless approved, in writing, by the PSC

J. The Contractor must provide the following protection.

1. The Contractor must exercise care during the Work to confine operations to the immediate areas of the hazardous materials to be removed. The physical means and methods used for protection must be at the Contractor's option. However, the Contractor must be completely responsible for replacement and restitution Work of whatever nature at no additional cost to the City.

2. Adequate protection of persons and property must be provided at all times. The Work must be executed in such a way as to avoid hazards to persons and property.

3. The Contractor must furnish signs, lights, barricades, and other Work equipment and temporary controls as may be necessary for the safe execution of the Work. The Contractor must remove when Work is completed.

4. The Contractor must take all possible actions to prevent hazardous materials from entering any surface area or drainage system.

5. The Contractor must maintain safe working conditions and meet all applicable laws and regulations. The Contractor must keep the Work area clean and secure at all times.

6. Workers must hold current certification in 40 hour OSHA training in accordance with OSHA 29 CFR 1910.120 (HAZWOPER).

3.2 EXAMINATION

A. The Contractor must conduct a site survey of hazardous materials to be removed:

B. The Contractor must verify hazardous materials locations, quantities, and classes.

C. The Contractor must identify ancillary non-hazardous waste to be removed with hazardous waste.

3.3 PREPARATION

A. The Contractor must notify the PSC a minimum of one week prior to commencement of hazardous materials Work.

B. The Contractor must prepare separate onsite areas for approved containment of hazardous wastes.

C. The Contractor must provide containers, vehicles, equipment, labor, signs, and labels as required for hazardous materials removal and disposal.

D. Prior to beginning on-site activities, the Contractor must obtain disposal permits for each of the materials to be disposed. The following methods in order of preference must be provided and must be conducted in accordance with federal, state, and local regulations.

1. Recycling

2. Reclamation

3. Incineration (including fuel blending and high temperature)

4. Secure chemical landfill

5. Aqueous treatment

6. Chemical treatment

E. Alternative methods must require written approval from the PSC Application for approval must contain a description and give the quantity of the waste, and the method that must be utilized.

3.4 WASTE CHARACTERIZATION

A. All waste disposal certificates and manifest shall be executed and signed by an authorized College representative prior to any waste leaving the project site. The Contractor shall coordinate all waste removal from the site with the CM for execution and signature on any waste manifest, and/or waste disposal certificate.

B. All waste that departs the site shall be delivered DIRECTLY to an approved landfill, disposal and/or recycling facility and shall not be stockpiled off-site or co-mingled with waste streams from other projects.

3.5 PERFORMANCE

A. The means and methods of performing the hazardous materials Work must be solely the responsibility of the Contractor.

B. Visual inspections and damage repairs must be made daily by the Contractor and/or as directed by the PSC to assure that product release and containment control measures are functioning properly. Damage caused by the Contractor must be repaired to the existing condition before the damage occurred at no additional cost to the City.

C. In order to prevent and to provide for abatement of any environmental pollution arising from removal activities in the performance of this Contract, the Contractor and all the subcontractors must comply with all applicable federal, state, and local laws, and regulations concerning environmental pollution control and abatement and controlling hazards.

3.6 REMOVAL, TRANSPORT, AND DISPOSAL

A. All waste disposal certificates and manifest shall be executed and signed by an authorized College representative prior to any waste leaving the project site. The Contractor shall coordinate all waste removal from the site with the CM for execution and signature on any waste manifest, and/or waste disposal certificate.

B. All waste that departs the site shall be delivered DIRECTLY to an approved landfill, disposal and/or recycling facility and shall not be stockpiled off-site or co-mingled with waste streams from other projects.

C. The Contractor must perform the hazardous materials removal procedures in accordance with all applicable Federal, State, and Local regulations including, but not limited to, the following:

1. 29 CFR 1910 Occupational Safety and Health Standards

2. 40 CFR 268 Land Disposal Regulations (USEPA)

D. The Contractor must use field instrumentation and/or laboratory analysis to collect and screen samples for waste stream profile.

E. The Contractor must segregate all materials into appropriate disposal facility classifications.

F. The Contractor must inspect and assure adequate and proper containment for all materials. If proper containment is not present, it is the Contractor's responsibility to properly package hazardous materials for transport.

G. The Contractor must arrange for proper vehicles and transport of all hazardous materials to the permitted disposal or salvage facilities.

H. The Contractor must be responsible for transporting and disposing of all hazardous materials to the permitted disposal facility, in accordance with the rules and regulations of the UEPA.

1. The Contractor must not transport hazardous materials off Site until evidence has been submitted to the PSC that disposal facility is authorized and must accept the hazardous materials.

2. Hazardous materials must NOT be transported off site that does not meet acceptance criteria of the intended disposal facility.

I. Hazardous waste left after Work hours must be properly secured with flashing barricades, caution tape, and/or fencing as deemed necessary during Contractor's hours away from the site.

J. The Contractor must provide proof that contaminated substances transported off-site were properly disposed of and must include the following minimum information.

1. Name and address of disposal or recycling facility.

2. Signature of authorized agent for the disposal or recycling facility.

3. Date shipment accepted.

4. Description of shipment.

5. Quantity of shipment.

6. Method of disposal or recycling.

K. Any planned deviations from this procedure must be communicated to the PSC in writing.

END OF SECTION 02 84 16

SECTION 04 22 00 - CONCRETE UNIT MASONRY

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. Concrete masonry units.
   2. Mortar.
   3. Miscellaneous masonry accessories.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties.

   2. Mortar admixtures.
   3. Anchors, ties, and metal accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
   2. Density Classification: Lightweight.
   3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less-than-nominal dimensions.
   4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Cement: ASTM C1329/C1329M.

F. Aggregate for Mortar: ASTM C144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

2.5 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use mortar cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For interior nonload-bearing partitions, Type O may be used instead of Type N.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern matching existing CMU construction; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c. unless otherwise indicated.
   3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
   4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
   4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
   5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.7 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Masonry Waste Recycling: Return broken CMUs that may be recycled to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Wood blocking and nailers.
   2. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater size but less than 5 inches nominal (114 mm actual) size in least dimension.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:
   1. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
   1. Treatment shall not promote corrosion of metal fasteners.
   2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
   1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Concealed blocking.
   2. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
   3. Plywood backing panels.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Cants.
   4. Furring.
   5. Grounds.

B. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
   1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
   2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.

3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F1667.

C. Screws for Fastening to Metal Framing: ASTM C1002, length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.6 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
1. Use for interior locations unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

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

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
   3. ICC-ES evaluation report for fastener.

L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

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

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Closet and utility shelving.
   2. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.
   3. Shop priming of interior architectural woodwork.
   4. Shop finishing of interior architectural woodwork.

B. Related Requirements:
   1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
   2. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Shop Drawings:
   1. Include the following:
      a. Dimensioned plans, elevations, and sections.
      b. Attachment details.
   2. Show large-scale details.
   3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
   4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each shop-applied finish specified.
   1. Plastic laminate: 8 by 10 inches, for each type, color, pattern, and surface finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For architectural woodwork manufacturer and Installer.

B. Evaluation Reports: For fire-retardant-treated wood materials, from ICC-ES.

1.6 CLOSEOUT SUBMITTLAS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
   1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
   2. Installer Qualifications: Manufacturer of products and Licensed participant in AWI's Quality Certification Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
   1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

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

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements.

2.2 ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. Provide certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

2.3 HARDWOOD SHEET MATERIALS

A. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of the Architectural Woodwork Standards for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.
   1. Particleboard: ANSI A208.1, Grade M-2.
   2. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.

2.4 FIRE-RETARDANT-TREATED WOOD MATERIALS

A. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
   2. For items indicated to receive a stained, transparent, or natural finish, use organic resin chemical formulation.
   3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
   4. Mill lumber before treatment, and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.

B. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture, to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less according to ASTM E84.
   1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2, except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf , respectively.

2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1, except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.
   1. Fire-Retardant Treatment: Complying with requirements; provide for all applications.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
   1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
   2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
   1. Disassemble components only as necessary for shipment and installation.
   2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
   3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
   4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.
      a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
      b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
   1. Shim as required with concealed shims.
   2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
   1. Secure with countersunk, concealed fasteners and blind nailing.
   2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
   3. For shop-finished items, use filler matching finish of items being installed.
      a. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with wood surface.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.
   1. Inspection entity shall prepare and submit report of inspection.

3.4 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade.

B. Where not possible to repair, replace defective woodwork.

C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.
   1. Fill nail holes with matching filler where exposed.
   2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 40 23

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

B. Related Requirements:
   1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. 3M Fire Protection Products.
      b. Construction Solutions.
      c. Hilti, Inc.
      d. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.
   3. Collars.
   4. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
   1. Locate in accessible concealed floor -ceiling, at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.5 FIELD QUALITY CONTROL

A. A qualified testing agency will be engaged to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Penetration Firestopping Systems with No Penetrating Items FS-1:
1. UL-Classified Systems: C-AJ-0001-0999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

C. Penetration Firestopping Systems with No Penetrating Items FS-2&3:
1. UL-Classified Systems: W-L-0001-0999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

D. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing FS-4:
1. UL-Classified Systems: C-AJ-1001-1999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

E. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing FS-5&6:
1. UL-Classified Systems: W-L-1001-1999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

F. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing FS-7:
1. UL-Classified Systems: C-AJ-2001-2999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

G. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing FS-8&9:
1. UL-Classified Systems:
2. W-L-2001-2999.
3. F-Rating: 1 hour and 2 hours.

4. T-Rating: 1 hour and 2 hours.
5. Type of Fill Materials: As required to achieve rating

H. Penetration Firestopping Systems for Electrical Cables FS-10:
1. UL-Classified Systems: C-AJ-3001-3999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

I. Penetration Firestopping Systems for Electrical Cables FS-11&12:
1. UL-Classified Systems: W-L-3001-3999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

J. Penetration Firestopping Systems for Cable Trays with Electric Cables FS-13&14:
1. UL-Classified Systems: WL-4001-4999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

K. Penetration Firestopping Systems for Insulated Pipes FS-15:
1. UL-Classified Systems: C-AJ-5001-5999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

L. Penetration Firestopping Systems for Insulated Pipes FS-15&16:
1. UL-Classified Systems: W-L-5001-5999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

M. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants FS-17:
1. UL-Classified Systems: C-AJ-6001-6999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

N. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants FS-18&19:
1. UL-Classified Systems: W-L-6001-6999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

O. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants FS-20:
1. UL-Classified Systems: C-AJ-7001-7999.
2. F-Rating: 2 hours.
3. T-Rating: 2 hours
4. Type of Fill Materials: As required to achieve rating.

P. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants FS-21&22:
1. UL-Classified Systems: W-L-7001-7999.
2. F-Rating: 1 hour and 2 hours.
3. T-Rating: 1 hour and 2 hours.
4. Type of Fill Materials: As required to achieve rating

Q. Penetration Firestopping Systems for Groupings of Penetrants FS-23:
   1. UL-Classified Systems: C-AJ-8001-8999.
   2. F-Rating: 2 hours.
   3. T-Rating: 2 hours
   4. Type of Fill Materials: As required to achieve rating.

R. Penetration Firestopping Systems for Groupings of Penetrants FS-24&25:
   1. UL-Classified Systems: W-L-8001-8999.
   2. F-Rating: 1 hour and 2 hours.
   3. T-Rating: 1 hour and 2 hours.
   4. Type of Fill Materials: As required to achieve rating

END OF SECTION 07 84 13

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Interior standard steel doors and frames.
   2. Interior custom hollow-metal doors and frames.

B. Related Requirements:
   1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

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

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For door inspector.
   1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
   2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
   3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.

B. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

D. Field quality control reports.

1.8 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, section 5.2.3.1 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
   1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Ceco/ASSA ABLOY

B. LaForce, Inc.

C. Steelcraft

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Standard-Duty Doors and Frames: ANSI/SDI A250.8, Level 1; ANSI/SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Uncoated steel sheet, minimum thickness of 0.032 inch.
      d. Edge Construction: Model 1, Full Flush.
      e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
      f. Core: Vertical steel stiffener.
      g. Fire-Rated Core: Manufacturer's standard vertical steel stiffener core for fire-rated doors.

   2. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.042 inch.
      b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
      c. Construction: Full profile welded.

   3. Exposed Finish: Prime.

2.4 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME ANCHORS

A. Jamb Anchors:
1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.

D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

E. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

F. Glazing: Comply with requirements in Section 088000 "Glazing."

2.8 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
   5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
      a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
      b. Install frames with removable stops located on secure side of opening.

   2. Fire-Rated Openings: Install frames according to NFPA 80.
   3. Floor Anchors: Secure with postinstalled expansion anchors.
      a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

   4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
   1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:
   1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
   2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

3.4 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 71 00 - DOOR HARDWARE

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. Mechanical door hardware for the following:
      a. Swinging doors.

B. Related Requirements:
   1. Section 08 11 13 "Hollow Metal Doors and Frames"

1.3 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security representative.

C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

A. Keying Conference: Conduct conference at Project site.
   1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security representative and building engineer.
   2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Flow of traffic and degree of security required.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. Requirements for access control.
      e. Address for delivery of keys.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
   2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
   3. Content: Include the following information:
      a. Identification number, location, hand, fire rating, size, and material of each door and frame.
      b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      d. Fastenings and other installation information.
      e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
      f. Mounting locations for door hardware.
      g. List of related door devices specified in other Sections for each door and frame.

C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fire-rated door hardware.
   1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Schedules: Final door hardware schedule.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
   1. Warehousing Facilities: In Project's vicinity.
   2. Scheduling Responsibility: Preparation of door hardware and keying schedule.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC).

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of doors and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

   2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
      a. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Draft-Control Door Assemblies: Where draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design", the current Illinois Accessibility Code, and the current Chicago Building Code.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

2. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

2.3 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule. Refer to drawing A109.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
   1. Bored Locks: Minimum 1/2-inch latchbolt throw.
   2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
   3. Deadbolts: Minimum **1-inch** bolt throw.

C. Lock Backset: 2-3/4 inches unless otherwise indicated.

D. Lock Trim:
   1. Description: Match existing. Verify manufacturer, style and finish in field.

E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

F. Mortise Locks: BHMA A156.13; Match existing. Verify manufacturer, style and finish in field.
   1. Confirm that the existing hardware is: Yale 8708 FL

2.5 LOCK CYLINDERS

A. Lock Cylinders: Coordinate core requirements with Owner. Match existing manufacturer, material and finish. Provide cylinder from same manufacturer of locking devices.

2.6 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
   1. Coordinate keying system with Owner.

2.7 OPERATING TRIM

A. Operating Trim: To match existing levers; bronze unless otherwise indicated. Verify manufacturer, style and finish in field.

2.8 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.9 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:
   1. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.

2.10 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.11 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

B. Base Metals: Produce door hardware units of base metal to match existing (verify in field), fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Fire-Rated Applications:
      a. Wood or Machine Screws: For the following:
         1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
         2) Strike plates to frames.
         3) Closers to doors and frames.

      b. Steel Through Bolts: For the following unless door blocking is provided:
         1) Surface hinges to doors.
         2) Closers to doors and frames.
         3) Surface-mounted exit devices.

   3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.12 FINISHES

A. Provide finishes to match existing door hardware. Verify in field.
   1. Confirm that existing hardware finish is BHMA 613 (US10B).

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to match existing facility hardware and to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.

E. Key Control System:
   1. Tag keys as determined by final keying schedule.

F. Thresholds: Set thresholds for doors indicated in full bed of sealant.

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
   1. Do not notch perimeter gasketing to install other surface-applied hardware.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include twelve months' full maintenance by skilled employees of door hardware Installer. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. Refer to drawing sheet A109 for Hardware Sets schedule.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

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. Glass products.
   2. Glazing sealants.
   3. Glazing tapes.
   4. Miscellaneous glazing materials.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products; 12 inches square.
   1. Tempered glass.
   2. Safety wired glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass.

1.7 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet.
   1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Warranty for Glass Products: Manufacturer agrees to replace glass units that fail and/or break due to manufacturing or installation defects.
   1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal movement without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets; deterioration of glazing materials; or other defects in construction.

B. Safety Wired Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category I.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations unless more stringent requirements are indicated.

B. Thickness: Where glass thickness is indicated, it is a minimum.

C. Strength: Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Safety Wired Glazing: Complying with ANSI Z97.1 and CPSC 16 CFR 1201 Cat I.

2.5 GLAZING SEALANTS

A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Neutral-Curing Silicone Glazing Sealant, Class 25: Complying with ASTM C920, Type S, Grade NS, Use NT.

2.6 GLAZING TAPES

A. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:
1. Neoprene with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:
1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:
1. Neoprene with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Minimum required face and edge clearances.
3. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

G. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

I. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations.
   1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type (GL-1): Fully tempered float glass.
   1. Minimum Thickness: 3/8 inch.

END OF SECTION 08 80 00

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions.
   2. Suspension systems for interior ceilings and soffits.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.

B. Studs and Tracks: ASTM C645.
   1. Steel Studs and Tracks:
      a. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
      b. Depth: 3-5/8 inches.

C. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing.
   1. Minimum Base-Steel Thickness: 0.0296 inch.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.
   1. Minimum Base-Steel Thickness: 0.0375 inch.
   2. Depth: As indicated on Drawings.

F. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
   3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
   2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:
   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c. maximum.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

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 gypsum board.

B. Related Requirements:
   1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Gypsum board, Type X.
   2. Mold and Moisture-Resistant Gypsum Board
   3. Sound-attenuation blankets.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C1396/C1396M.
   1. Manufacturers:
      a. CertainTeed Gypsum
      b. National Gypsum Company
      c. USG Corporation

   2. Thickness: 5/8 inch.
   3. Long Edges: Tapered.

B. Mold and Moisture-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
   1. Core: 5/8 inch Type X.
   2. Long Edges: Tapered.
   3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. L-Bead: L-shaped; exposed long flange receives joint compound.
      d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      e. Expansion (control) joint.
      f. Base-of-Wall Galvanized Moisture Barrier Trim: Galvanized-steel sheet, 2 inches high.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.

   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

C. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

D. Form control and expansion joints with space between edges of adjoining gypsum panels.

E. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

F. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge

trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Vertical surfaces unless otherwise indicated.
   2. Mold and Moisture-Resistant Gypsum Board: As indicated on Drawings

B. Single-Layer Application:
   1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
      b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

   2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
   1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners unless otherwise indicated.
   2. LC-Bead: Use at exposed panel edges.
   3. L-Bead: Use where indicated.
   4. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints**,** rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

   3. Level 5: Where indicated on Drawings.
      a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

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

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Ceiling suspension-system members.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E1264.
   2. Smoke-Developed Index: 450 or less.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS

A. Armstrong, “Ultima” custom panels with beveled edge:
   1. (ACT-1): MR87096: 20-inch x 60-inch x 0.75-inch
   2. (ACT-2): MR87097: 18-inch x 60-inch x 0.75-inch

B. Color: White

C. Ceiling Attenuation Class (CAC): Not less than 35.

D. Noise Reduction Coefficient (NRC): Not less than 0.75.

E. Edge/Joint Detail: Beveled

F. Thickness: 3/4 inch.

G. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEM

A. Match existing.

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
   1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
   2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch-diameter wire.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
   2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C636/C636M, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to power-actuated fasteners that extend through forms into concrete.
   6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   7. Do not attach hangers to steel deck tabs.
   8. Do not attach hangers to steel deck. Attach hangers to structural members.
   9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. As indicated on reflected ceiling plans.
      b. Install panels in a basket-weave pattern. Match existing ceiling pattern – verify in field.

   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
   3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Thermoset-rubber base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. To match Roppe

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
   1. Style and Location:
      a. Style B, Cove: Provide in areas with resilient floor coverings.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Field formed.

G. Inside Corners: Field formed.

H. Colors: To match 638 Cadet

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16 - RESILIENT SHEET FLOORING

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. Unbacked rubber sheet flooring.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient sheet flooring.
   1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than 6-by-9-inch sections.
   1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.

D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

E. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
   1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 UNBACKED RUBBER SHEET FLOORING (RF-1)

A. MANUFACTURERS:
   1. Nora Systems, Inc.
   2. Johnsonite/Tarkett
   3. Mannington

B. Product Standard: ASTM F1859.
   1. Type: Type I, homogeneous rubber sheet floor covering.
   2. Thickness: 3mm.
   3. Hardness: Manufacturer's standard hardness, measured using Shore, Type A durometer per ASTM D2240.

C. Wearing Surface: Smooth.

D. Sheet Width: As standard with manufacturer.

E. Seamless-Installation Method: Heat welded.

F. Colors and Patterns: Match Architect's sample.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

C. Seamless-Installation Accessories:
   1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
      a. Colors: Match flooring.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
   1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:
   1. Maintain uniformity of flooring direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
   3. Match edges of flooring for color shading at seams.
   4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Seamless Installation:
   1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:
   1. Remove adhesive and other blemishes from surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
   1. Apply number of coats as recommended by flooring manufacturer.

E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 91 23 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
   1. Wood.
   2. Gypsum board.
   3. Plaster.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Benjamin Moore & Co.

B. Pratt & Lambert

C. Sherwin-Williams Company

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: Match Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Fiber-Cement Board: 12 percent.
   2. Masonry (CMUs): 12 percent.
   3. Wood: 15 percent.

4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Wood Substrates:
1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      h. Other items as directed by Architect.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Wood Substrates: Wood trim and Doors.
   1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
      a. Prime Coat: Primer, latex, for interior wood, MPI #39.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss MPI Gloss Level, MPI #147.

B. Gypsum Board and Plaster Substrates:
1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC Eggshell MPI Gloss Level 3, MPI #145.

END OF SECTION 09 91 23

SECTION 10 11 00 - VISUAL DISPLAY UNITS

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. Visual display board assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

B. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints.
   3. Include sections of typical trim members.
   4. Include wiring diagrams for power and control wiring.

C. Samples for Verification: For each type of visual display unit indicated.
   1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch-long sections of each trim profile.
   3. Display Rail: 6-inch-long section of each type.

D. Product Schedule: For visual display units.
   1. (MB01): 5’-0” h x 8’-0” w trimmed markerboard with bottom tray.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 FIELD CONDITIONS

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

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.

   2. Warranty Period: **5** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

2.2 VISUAL DISPLAY BOARD ASSEMBLY (MB01)

A. Manufacturers:
   1. AARCO Products, Inc
   2. Egan Visual, Inc.
   3. Marsh Industries, Inc.

B. Visual Display Board Assembly: Factory fabricated.
   1. Assembly: Markerboard.
   2. Corners: Square.
   3. Width: 8 feet (96 inches).
   4. Height: 5 feet (60 inches).
   5. Mounting Method: Rail support system.

C. Markerboard Panel: Porcelain-enamel-faced markerboard panel on core indicated.
   1. Color: White.

D. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; standard size and shape.
   1. Field-Applied Trim: Manufacturer's standard, snap-on trim with no visible screws or exposed joints.
   2. Aluminum Finish: Clear anodic finish.

E. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect and indicated on approved Shop Drawings.

2.3 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

D. Prime and paint wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings.

C. Rail Support System: Install horizontal support rail at mounting heights to coordinate with display unit mounting heights indicated on Drawings. Attach to wall with fasteners at 12 inches o.c.
   1. Hang visual display units on rail support system.

3.4 CLEANING AND PROTECTION

A. Clean visual display units in accordance with manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 10 11 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

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. Fire-protection cabinets for the following:
      a. Portable fire extinguisher.

B. Related Requirements:
   1. Section 10 44 16 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.
   1. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

B. 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.

2.3 FIRE-PROTECTION CABINET See the table at the end of the Evaluations for a list of manufacturers' products. Use this table in combination with manufacturers' catalogs or product data to insert series, type, model, and designations of other characteristics.

A. Cabinet Type: Suitable for fire extinguisher.

B. Cabinet Construction: Nonrated, Two-hour fire rated.
   1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch-thick cold-rolled steel sheet lined with minimum 5/8-inch-thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel.
   1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:
   1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet.

G. Door Style: Horizontal duo panel with frame.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide projecting door pull and friction latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. Accessories:
   1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate to match existing.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER".
         1) Location: Applied to cabinet door.
         2) Application Process: Decals.
         3) Lettering Color: Red.
         4) Orientation: Horizontal, to match existing.

K. Materials:
   1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
      a. Finish: Factory primed for field painting.

b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
c. Color: Paint to match partition, match Architect's sample.

2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated at heights acceptable to authorities having jurisdiction; match existing.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets.
   2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Identification:
   1. Apply decals at locations indicated.
   2. Apply decals on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 51 13 - METAL LOCKERS

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. Welded corridor lockers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: For metal lockers.

   1. Include plans, elevations, sections, and attachment details.
   2. Show locker trim and accessories.
   3. Include locker identification system and numbering sequence.

C. Samples: For each color specified, in manufacturer's standard size.

D. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of adjacent partitions by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate sizes and locations of bases for metal lockers.

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.3 WELDED CORRIDOR LOCKERS

A. Manufacturers:
1. Lyon
2. Penco
3. De Bourgh

B. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.
b. Security Vents: Manufacturer's standard, stamped horizontal.
c. Perforated Vents: Manufacturer's standard shape and configuration.

C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
2. Backs: 0.048-inch nominal thickness.
3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees; self-closing.
1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

F. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with padlocks; positive automatic latching.

a. Latch Hooks: Equip doors less than 48 inches high with two latch hooks; fabricated from 0.12 nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging latching mechanism.

G. Door Handle and Latch for Lockers: Stainless steel strike plate with integral pull; with steel padlock loop.

H. Latches: Finger-lift latch control designed for use with padlocks.

I. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

J. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.

K. Continuous Zee Base: Fabricated from, 0.075-inch nominal-thickness steel sheet.

1. Height: 4 inches.

L. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

M. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

N. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

O. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

P. Finish: Baked enamel or powder coat.

1. Color: Manufacturer's standard Gray.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Equipment: Provide each locker with an identification plate and the following equipment:
1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds smooth and flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Zee Base: Fabricated in lengths as long as practical to enclose base and base ends; finished to match lockers.

G. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

I. Finished End Panels: Fabricated to conceal unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor.

B. Welded Lockers: Connect groups together with manufacturer's standard fasteners, with no exposed fasteners on face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Identification Plates: Identify metal lockers with identification indicated on Drawings.

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 11 53 13 – LABORATORY FUME HOODS AND SAFETY CABINETS

PART 1 - GENERAL

1.1 SUMMARY

1. Laboratory fume hoods.
2. Base Cabinets:

    a. Base cabinets for fume hoods.

3. Fume hood accessories.
4. Safety Cabinets.
5. Related equipment and work.

    a. Laboratory mechanical service fixtures installed in hoods.
    b. Laboratory electrical service fixtures installed in hoods.
    c. Pre-pipe fume hoods to a single connection. Refer to Division 22 Sections.

B. Related Sections: Requirements that relate to this section are included but not limited to the sections below.

1. Division 1 “General Requirements”.
2. Division 1 Section “Construction Waste Management” for construction waste management plan requirements.
3. Division 12 Section “Wood, Metal Laboratory Casework” for wood base cabinets.
4. Division 12 Section “Laboratory Tops, Sinks, Mechanical Service Fixtures and Accessories” for the following.
    a. Laboratory mechanical service fixtures installed in hoods.

5. “Mechanical” to include but not limit to the following.

    a. Exhaust ductwork transition from hood collar to ductwork is in work of Division 23.
    b. Final connections of ductwork to hood collar in work of Division 23.
    c. Laboratory piping systems in hoods are to be installed as per requirements in Division 22 and 23.
    d. Integration of lab control system components into the fabrication of the fume hoods per requirements in Division 25 Section “Lab Control System.”
    e. Other mechanical work.

6. Division 26 “Electrical to include but not limit to the following.

    a. Laboratory electrical service fixtures installed in hoods.
    b. Other electrical work.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Design, engineer, fabricate, and install work in compliance with specified standards, performance requirements, material selections, and requirements of this and related sections.

1. All stand-up height casework, including fume hoods, are to have a working surface height not greater than 34 inch (914.4 mm) above the finished floor surface, unless specifically indicated.

a. Where knee spaces are shown, vertical clearance shall not be less than 27 inch (685.8 mm) above the finished floor.

B. Performance Requirements:

1. General performance:

a. Design fume hoods so that, when connected to exhaust system that provides proper exhaust volume under normal laboratory conditions, fume hoods will operate in a safe, efficient manner, within acceptable tolerances for face velocities specified.
b. Dead air pockets and reverse air currents will not be permitted along surface of hood interiors.

2. System Interface Requirement:

a. Hoods shall be prepared to accept fitting of control systems interfacing with building ventilation equipment.
b. Interface controls typically include a sash position sensor mechanism and various electronic controls.

3. Pre-piping and Pre-wiring:

a. Fume hoods shall be completely pre-piped and pre-wired at the point of manufacture.
b. All service fixtures shall be mounted, joints and connections tested, and all utility services brought to a single area at the rear of the hood.
c. Coordinate exact location of field connections with process piping contractor.
d. Hoods shall require only a single final field connection for each utility service.
e. Piping and wiring shall conform to local building codes.

4. Fume Hood:

a. Fume hood exhaust control incorporated into the hood casing.
b. The components shall be flush mounted.
c. The hood manufacturer shall be responsible for coordinating the installation of the hood exhaust control into the hood in the factory.
d. The hood shall arrive on site with the listed components installed into the hood as per the hood exhaust controls manufacturer’s requirements.
e. The controls components shall include: fume hood monitor.
f. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
g. Design fume hoods for consistent and safe air flow through the hood face. Negative variations of face velocity shall not exceed 20% of the average face velocity at any designated measuring point as defined in this section.

h. Average Illumination of Work Area: Minimum 80 foot-candles. Work area shall be defined as the area inside the superstructure from side to side and from face of baffle to the inside face of the sash, and from the working surface to a height of 28 inches.
i. Fume hood shall be designed to minimize static pressure loss with adequate slot area and bell shaped exhaust collar configuration. Maximum average static pressure loss readings taken three diameters above the hood outlet from four points, 90 degrees apart, shall not exceed the following maximums with sash in full open position:

Face Velocity	Measured S.P.L. (W.G.)
60 F.P.M.	.15 inches
80 F.P.M.	.30 inches

j. Fume hoods shall be available in standard width of 4-feet. Each size will have these depths available: 31.25".
k. Noise Criteria: Test data of octave band analysis verifying hood is capable of a 50 NC value when connected to a 50 NC HVAC source. Reading taken 3' in front of open sash at 100 fpm face velocity.
l. Interior and exterior materials of construction and finishes shall meet the usage and this specification requirements.

C. Item Designations in Specifications and on Drawings:

1. Alphanumeric designations for casework, fume hoods or equipment consist of up to six characters.

a. The first two numerals where given, are the face width of the item, in inches.
b. The remaining two to four characters designate a specific elevation and item description in the contract documents.

1.3 SUBMITTALS

A. General: Submit in compliance with Division 1 Section "Submittal Procedures".

B. Product Data:

1. Submit for action. Describe the properties of items to be used in the Work. Include the following.

a. Submit manufacturer's data for each component and item of laboratory equipment specified.
b. Submit component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.
c. Submit liner and exterior finish tests by independent third party.

2. Submit for Information: The Architect will not apply action stamp and will return information with comments if any for information only.

a. Instructions to be inscribed on instruction plate to be attached to hood, as specified in Part 2 of this Section.
b. Written instructions in booklet form providing additional details on safe and proper operation and maintenance.
c. Professional quality video - minimum 15 minutes in length on proper hood usage.

C. Shop Drawings: Submit for action. Show fabrication and installation of the Work. Include the following.

1. Indicate plans, elevations, ends, cross-sections, service run spaces, location and type of service fixtures with lines thereto; details and location of anchorages and fitting to floors, walls, and base; layout of units with relation to surrounding walls, doors, windows, lighting and air-conditioning fixtures, and other building components; connection to hood exhaust system; location of access doors, cut-off valves, junction boxes.

    a. Coordinate shop drawings with delivery of other work involved.
    b. Provide roughing-in drawings for mechanical and electrical services.

D. Samples:

1. Initial Selection: Submit for action. Furnish manufacturer's complete color selection showing full range of colors and finish characteristics. Furnish the following.

    a. Submit full range of finish for fume hood, work surfaces and for other pre-finished equipment and accessories.

2. Verification: Submit for action. Furnish materials to be used with labels indicating colors, finish characteristics, and locations of the Work. Samples will be reviewed for color and appearance only. Furnish the following.

    a. Submit 3 x 6 inch samples in finishes selected.

E. Quality Assurance: Submit the following for information:

1. Test Reports:

    a. Submit test reports on each size and type of hood verifying conformance to test performances specified. Test report must accompany each hood as part of installation and usage package. Submit independent test reports as required by specification.

        1) Fume Hood must be Underwriters Laboratories subject 1805 classified.
        2) The 1805 standard covers electrical and mechanical hazards, investigates the flammability of materials and measures the effectiveness of airflow characteristics. Proper labeling must be affixed to the face of each fume hood indicating classification to the UL 1805 standard for Laboratory Fume Hoods.
        3) UL listing covering electrical components only or other listings that do not encompass all issues covered in UL 1805 is insufficient.
        4) All factory testing shall be performed in a U.L. certified test facility.

2. Certificates:

    a. Written verification of compliance to UL-1805 fume hood standard is mandatory.

F. Closeout Submittals: Submit the following to the Owner.

1. Maintenance and operating manual.
2. Record documents.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Contractor is responsible for quality control of the Work.
2. Manufacturer: A firm experienced in successfully producing work similar to that indicated for this Project, with a record of successful in-service performance, and with sufficient production capacity to produce required units without causing delay in the Work.

a. Five years or more experience in manufacture of laboratory casework and equipment of type specified.
b. Ten installations of equal or larger size and requirements. Provide contact at each.

3. Installer: An installer trained in the use of the materials and equipment to be employed in the Work.

a. Factory certified by the manufacturer.

B. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Single Source Responsibility:

1. Obtain materials from a single manufacturer for each different product required.
2. Provide laboratory fume hoods (for integration with laboratory furniture, tops, sinks, accessories and service fixtures, as required) manufactured or furnished by laboratory furniture company for single responsibility.

D. Pre-Installation Meetings: Contractor to conduct meetings at site with installer prior to start of Work. Familiarize installer with conditions at site and related Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver materials in manufacturer’s original packaging with label indicating pertinent information identifying the item. Store materials in accordance with manufacturer’s instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.

1. Coordinate delivery of fume hoods with delivery of other laboratory furniture components.

C. Do not deliver or install equipment until the following conditions have been met:

1. Windows and doors are installed and the building is secure and weather tight.
2. Ceiling, overhead ductwork and lighting are installed.
3. All painting is completed and floor tile located below casework is installed.

D. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide the same manufacturer for laboratory fume hoods, canopy hoods, related products and the same laboratory casework company supplying casework.

B. Manufacturers offering laboratory fume hoods, subject to compliance with project requirements, include the following:
   1. Kewaunee Scientific Equipment Corp., P.O. Box 1842, Statesville, NC 28687
   2. Labconco Corporation, 8811 Prospect Avenue, Kansas City, MO 64132
   3. Mott Manufacturing Limited, 452 Hardy Road, P.O. Box 1120 Brantford, ON, Canada N3T

2.2 MATERIALS

A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; gauges U.S. Standard and galvanized.

B. Stainless steel: Type 304; gauges U.S. Standard.

C. Ceiling closure panels: Minimum 18 gauge; finish to match hood exterior.

D. Downdraft bypass: Low resistant type, 18 gauge steel chamber, directional louvers – not acceptable. All bypass air shall enter top of bypass chamber and enter hood in a downflow direction. Chamber shall protect user from expelled particulate in the event of an adverse internal reaction.

E. Safety glass: 7/32" thick laminated safety glass or 3/8” thick laminated safety glass viewing panel.

F. Sash chain: ANSI #35 steel, single strand. Average tensile strength of 2,400 pounds, maximum working load of 480 pounds.

G. Sash guides: Extruded PVC.

H. Pulley assembly for sash chain: Finish bored steel drive sprockets and keyed drive, 1/2” diameter. front connector shaft. Rear idler sprockets; double sealed ball bearings type, lubricated. All sprockets steel with zinc dichromate finish.

I. Sash pull: Full width corrosion resistant steel with chemical resistant powder coating. Maximum 1.5” thick.

J. Gaskets: White 70 durometer PVC for interior access panels. Gasket interior access panels to eliminate air leakage and to retain liquids inside hood.

K. Fastenings:

   1. Exterior structural members attachments: Sheet metal screws, zinc plated.
   2. Interior fastening devices concealed. Exposed screws not acceptable. (Screw head "caps" not acceptable.)

3. Exterior side access panel member fastening devices to be exposed corrosion resistant, non-metallic material, creating a positive mechanical latch. Latch must be flush type. Exposed screws or velcro type fasteners are not acceptable.

L. Instruction plate: Corrosion resistant or plastic plate attached to the fume hood exterior with condensed information covering recommended locations for apparatus and accessories, baffle settings and use of sash.

2.3 FABRICATION

A. Chemical Fume Hood.

1. Superstructure: Rigid, self-supporting assembly of double wall construction, maximum 4-7/8" thick.

    a. Wall consists of a sheet steel outer shell and a corrosion resistant inner liner, and houses and conceals steel framing members, attaching brackets and remote operating service fixture mechanisms and services. Panels must be attached to a full frame construction, minimum 14 gauge galvanized members. Panels and brackets attached to eliminate screw heads and metallic bracketry from hood interior.
    b. Access to fixture valves concealed in wall provided by exterior removable access panels, gasketed access panels on the inside liner walls, or through removable front posts.
2. Exhaust Duct Collar: Provide Type 316L stainless steel, minimum 18-gauge, duct collar with 1½-inch (38 mm) to 2-inch (50 mm) extension above top of fume hood with butt joint termination suitable for welding. Duct collar design shall be bell-mouthed for round or contoured design for rectangular to provide lower static pressure drop and improved noise performance. Duct collar shall be integral to fume hood construction, factory installed, and welded or permanently sealed airtight to hood.
3. Exhaust Duct Transition Piece: Furnished by the fume hood manufacturer for installation by the mechanical contractor. Provide contoured Type 316L stainless steel, minimum 18-gauge, exhaust duct transition piece to connect to the fume hood exhaust duct collar and Laboratory exhaust duct system as shown on the Mechanical Drawings. Provide butt joint terminations suitable for welding.
4. Ceiling Closure Panels: Panel shall include simple-to-operate means of access to the hood lighting fixture without the use of tools. Finish shall match superstructure exterior. Closure panel shall conceal view of the sash when the sash is in the open position. Provide sash pocket if required to allow correct operation of the bypass.
    a. Provide 18 gauge steel paneled enclosure from top of hood to 2 inches above the ceiling.
5. Trim and Side Panels: Provide matching steel trim and side panels, as required, to finish any openings around and between hoods. Finish shall match superstructure exterior.
6. Access Opening Perimeter: Air foil or streamlined shape with all right angle corners radiused or angled. Bottom horizontal foil shall provide nominal one inch bypass when sash is in the closed position. Bottom foil shall not be removable without use of special tools. Bottom foil shall provide access area sufficient in size to pass thru hospital grade electrical plugs. Bottom foil: Steel with urethane powder coating to increase acid and abrasion resistance. Air foil and sill to be flush with the height of the work surface. A secondary containment trough shall be located in front of the work surface and extend below the airfoil sill.
7. Fume Hood Sash: Horizontal sash access with a 35” high sight line. Sash shall be top hung on nylon tired stainless steel ball bearing wheels. Sash frame on bottom and sides must be no more than 1.5” thick and radiused to minimize turbulence. Area above the 28” vertical sash opening shall be glazed with a minimum of 3/8” thick laminated safety glass. All glass to have polished exposed edge treatment.

a. Counter Balance System: Single weight, sprocket and chain, counter balance system which prevents sash tilting and permits ease of operation at any point along full width pull. Maximum 7 pounds pull required to raise or lower sash throughout its full length of operating sash opening. Design system to hold sash at any position without creep and to prevent sash drop in the event of cable failure. Life cycle test sash and weight. Provide independent test data. (See 2.02 F, G and H for material descriptions.) Open and close sash against rubber bumper stops.

8. Airfoil: The airfoil will be flush to the worksurface with ample room for electrical hospital grade cords to fit beneath the airfoil. This sill to be used on both Sash Types. Sill be ergonomically radiused on front edge. Sill must pivot forward to provide cord and trough access. Airfoil sills that are not flush with the top plane of the work surface are not acceptable.
9. Fume Hood Liner: Poly-resin (product number denoted by the suffix "P"): Reinforced polyester panel; smooth finish and white color in final appearance. Flexural strength: 14,000 psi. Flame spread: 15 or less per U.L. 723 and ASTM E84-80. Baffle must be same material as liner. Metallic baffles, brackets or supports on hood interior – not acceptable. Liner and baffle material must meet 1.03 performance test. Independent test validation is mandatory.
10. Baffles: Baffles providing controlled air vectors into and through the fume hood must be fabricated of the same material as the liner. Provide minimal exhaust slots full height on vertical sides of the baffle. High performance 2-piece baffle will be used. Baffle shall incorporate exhaust slots located to purge the upper and lower area of the hood. Baffle to be non-adjustable. Baffles with manual or automatic adjustment are not acceptable. Minimum depth of 19" for interior workspace is required at the extreme upper portion of the fume hood to provide maximum interior work area. All baffles, supports, and brackets to be non-metallic.
11. Auto-Sash: Sash shall be designed to promote usage as an upper body and face shield. Face velocities and volumes shall be based on an 18” operating opening. Sash shall have the capability to be raised to full 28.5” vertical opening for loading or unloading of large apparatus. A lock-open shall be provided. Sash shall lower automatically to the operating position when released from any position above 18”. Auto-sash function shall be life cycle tested and not incorporate the need for motor drives. Submit third party validation of life cycle tests.
12. Service Fixtures and Fittings: Color coded washers at hose nozzle outlets and valves mounted inside the fume hood and controlled from the exterior with color coded index handles.

    a. Valves: Needle point type with self-centering cone tip and seat of hardened stainless steel. Tip and seat shall be removable and replaceable.
    b. Provide piping for all service fixtures from valve to outlet: Galvanized iron or copper for water, air and vacuum and black iron for gas services.
    c. Fixtures exposed to hood interior: Brass with chemically resistant color coded powder coating.
    d. Remote control handles: Black nylon four-arm handle with nylon color-coded index buttons.
    e. Services: As shown or specified.

13. Hood Light Fixture: Two lamp, rapid start, UL listed fluorescent light fixture with sound rated ballast installed on exterior of roof. Provide safety glass panel cemented and sealed to the hood roof.

    a. Interior of Fixture: White, high reflecting plastic enamel.
    b. Size of Fixture: Largest possible up to 48" for hoods with superstructures up to six feet. Provide two 36" fixtures for hoods with eight foot superstructures.
    c. Include Lamps with Fixtures. Hoods without lamps – not acceptable.
    d. Illumination: Per performance values, Part 1 of this Section.
    e. Access to light thru lintel panel – no tools required.

14. Electrical Services: Three wire grounding type receptacles rated at 120 V.A.C. at 20 amperes. Provide 250 V.A.C. receptacles where specified. Flush plates: Black acid resistant thermoplastic.
15. Work Surfaces: 1-1/4" thick surface, dished a nominal 3/8” to contain spills.

    a. Molded resin work surfaces for hoods with Poly-resin liners.

B. High Efficiency By-Pass Type Fume Hood:

1. Restricted bypass fume hoods for constant volume exhaust systems with built-in automatic compensating bypass to maintain constant exhaust volume regardless of sash position.
2. Bypass: Positive in action and controlled by the sash operation.
3. Low resistance opening at top of front lintel panel. Bypass shall provide a smooth downflow effect.
4. As sash is lowered to 6”, bypass design shall limit the increase in face velocity to maximum of three times the average face velocity with the sash full open.

C. Finish:

1. Steel:

    a. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pretreat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.
    b. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high-grade laboratory furniture quality finish of the following thickness:

        1) Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
        2) Backs of cabinets and other surfaces not exposed to view: 1.0 mil average.
        3) Colors: As selected by Architect from manufacturer’s full line.

    c. Chemical Resistance:

        1) The basis for the finish performance test shall be SEFA (Scientific Equipment & Furniture Association) 8 1999 standards. The purpose of the chemical test is to evaluate the resistance a finish has to chemical spills.
        2) Obtain one sample panel measuring 14” X 24”. The received sample to be tested for chemical resistance and described herein.
        3) Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel at ambient temperature 73 degrees +/- 3 degrees and 50+/-5% relative humidity using the following rating system. Test the panel for chemical resistance using 49 different chemical reagents.

2.4 SOURCE QUALITY CONTROL

A. Evaluation of manufacturer's standard product shall take place in manufacturer's own test facility, with testing personnel, samples, apparatus, instruments, and test materials supplied by the manufacturer at no cost to the Owner.

B. Submit test report consisting of the following test parameters and equipment for each hood width and configuration specified.

C. Hood shall achieve a rating of 4.0 AM 0.05 PPM or better. Tested to ASHRAE-110-1995.

D. Test facility: Sufficient size to provide unobstructed clearance of five feet each side and ten feet in front of fume hood. Provide make-up air to replace room air exhausted through fume hood and to obtain a negative 0.2" w.g. room pressure. Introduce make-up air in a manner that minimizes drafts in front of hood to less than 20% of the face velocity. Connect 100 feet per minute air velocity through face of fume hood. Adjustment in blower shall vary face velocity down to 75 feet per minute.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine and correct conditions of area to receive the Work prior to installation.

3.2 INSTALLATION

A. General: Install system in accordance with manufacturer’s printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.

B. Install fume hoods plumb, level, rigid, securely anchored to building and adjacent furniture in proper location, in accordance with manufacturer's instructions. Install closures neatly. Securely attach access panels but provide for easy removal and secure reattachment.

C. Coordinate sequence of work with mechanical and electrical trades and related laboratory casework and fixtures installation.

D. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations.

3.3 FIELD QUALITY CONTROL

A. Site Test: Testing laboratory, engaged at the Contractor’s expense, will perform the following activities. Work not meeting specified requirements and other units having similar deficiencies shall be corrected at no cost to the Owner.

1. Field test each unit after completion of installation to verify proper operation of hoods in accordance with specified requirements. Perform tests in accordance ANSI/ASHRAE 110 “Method of Testing Performance of Laboratory Fume Hoods”

3.4 ADJUSTING

A. Moving Parts: Check to insure smooth, near-silent, and accurate operation; sash operation with one hand with uniform contact of rubber bumpers; counterbalances operate without interference; uniform contact of rubber bumpers.

B. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to Owner.

C. Adjust sash, fixtures, accessories and other moving or operating parts to function smoothly.

3.5 CLEANING

A. Construction Waste Management:

1. At the end of each work day, recycle or dispose of unused material, debris and containers in accordance with Division 1 Section “Construction Waste Management”.

B. Clean equipment, touch up as required.

3.6 DEMONSTRATION

A. Factory trained manufacturer representative shall provide demonstrations to Owner’ staff.

3.7 PROTECTION

A. Protect the Work so it will not deteriorate or be damaged. Remove protection at time of Substantial Completion.

B. Provide all necessary protective measures to prevent exposure of equipment from exposure to other construction activity.

C. Advise contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

3.8 SCHEDULES

A. Basis of Design:
1. Mott Manufacturing, NovaGuard Vertical Sash fume hood

B. See LF1-1 for fume hood schedule

C. See LF1-1 for fume hood base cabinet schedule

END OF SECTION 11 53 13

SECTION 12 3450 – WOOD AND METAL LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Flush overlay manufactured wood casework as indicated on Drawings.
   2. Flush overlay metal casework as indicated on the Drawings (Alternate #03 for Microbiology Lab 2175 and Microbiology Prep Lab 2208.)
   3. Laboratory casework systems that include utility-space and center bench shelving support framing, filler and closure panels

B. Related Sections: Requirements that relate to this section are included but not limited to the sections below.

   1. Division 1 “General Requirements”.
   2. Division 9 Section “Resilient Base and Accessories.”
   3. Division 11 Section "Laboratory Fume Hoods."
   4. Division 12 Section "Laboratory Tops, Sinks, and Accessories."
   5. Division 22 Section “Plumbing.”
   6. Division 23 Section "Heating Ventilating, and Air-Conditioning."
   7. Division 26 Section “Electrical.”

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Design, engineer, fabricate, and install work in compliance with specified standards, performance requirements, material selections, and requirements of this and related sections.

   1. All casework, work surfaces and service fixture construction and performance characteristics shall be in full compliance with SEFA (Scientific Equipment and Furniture Association) standards. At the owner’s request, independent, third party testing must be submitted validating compliance and adheres to the architectural specifications.

      a. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment.
      b. SEFA 3 – Work Surfaces
      c. SEFA 7 – Laboratory and Hospital Fixtures
      d. SEFA 8 – Laboratory Furniture

B. Performance Requirements:

1. Structural performance requirements: Casework components shall withstand the following minimum loads without damage to the component or to the casework operation:

    a. Base unit load capacity: 500 lbs. per lineal foot.
    b. Suspended units: 300 lbs.
    c. Drawers in a cabinet: 150 lbs.
    d. Utility tables (4 legged): 600 lbs. (with levelers)
    e. Hanging wall cases: 300 lbs.
    f. Load capacity for shelves of base units, wall cases and tall cases: 40 lbs. per square foot, maximum load – 200 lbs. up to 48” wide.

C. Catalog Standards:

1. Manufacturer's catalog numbers may be shown on the Drawings for convenience in identifying certain laboratory cabinet work. Unless modified by notation on the Drawings or otherwise specified, the catalog description for the indicated number constitutes the requirements for each such cabinet.
2. The use of catalog numbers, and the specific requirements set forth in the Drawings and Specifications, are not intended to preclude the use of any other acceptable manufacturer's products or procedures which may be equivalent, but are given for the purpose of establishing a standard of design and quality for materials, construction and workmanship.

D. Item Designations in Specifications and on Drawings:

1. Alphanumeric designations for casework, fume hoods or equipment consist of up to six characters.

    a. The first two numerals where given, are the face width of the item, in inches.
    b. The remaining two to four characters designate a specific elevation and item description in the contract documents.

1.3 SUBMITTALS

A. General: Submit in compliance with Division 1 Section “Submittal Procedures”.

B. Product Data:

1. Submit for action. Describe the properties of items to be used in the Work. Include the following.

    a. Submit manufacturer's data and installation instructions for each type of laboratory furniture and darkroom equipment unit. Include independent laboratory certification that each applied finish complies with specified chemical and physical resistance requirements.

C. Shop Drawings: Submit for action. Show fabrication and installation of the Work. Include the following.

1. Submit shop drawings for laboratory furniture and darkroom equipment showing plans, elevations, ends, cross-sections, service run spaces, location and types of service fixtures with lines there to. Show details and location of anchorages and fitting to floors, walls, and base. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
2. Coordinate shop drawings with other work involved.

D. Samples:

1. Initial Selection: Submit for action. Furnish manufacturer's complete color selection showing full range of colors and finish characteristics. Furnish the following.

a. Material as requested by Architect.

2. Verification: Submit for action. Furnish materials to be used with labels indicating colors, finish characteristics, and locations of the Work. Samples will be reviewed for color and appearance only. Furnish the following.

a. Submit 6" x 6" samples of specified finishes.
b. Submit full-size samples of finished wood cabinet unit complete with hardware, doors and drawers, without finish top.
c. Submit full-size samples of finished wood wall-mounted cabinets unit complete with hardware, doors, and adjustable shelves.
d. Furnish both hinged and sliding door samples if in project.
e. Acceptable sample units will be used for comparison inspections at the project. Retain acceptable sample units in the building until completion and acceptance of the work. Remove sample units from the premises when directed by the Architect.

E. Closeout Submittals: Submit the following to the Owner.

1. Record documents.

1.4 MOCKUP

A. Provide and install products within this scope of work as part of the laboratory mockup.
1. Mockup selection; Student Station room 2175. See 16 – 19/LF1-4. Selection to be confirmed by Architect and Owner.

B. The mockup will be reviewed and appropriate comments documented. The mockup and the associated comments will become a quality sample against which the remainder of the product installation will be compared.

C. Disposition of mockup

1. Mockup items may be incorporated into the final project subject to approval and or corrections as identified in the mockup review.

D. Coordinate the delivery, installation, and review of the mockup with the contractor. The mockup should be complete and reviewed prior to the fabrication of the remainder of the project. To the extent that the subcontractor elects to fabricate the project prior to review and approval of the mockup, it is understood that this is “at risk” and items may require re-fabrication to address issues that arise from the mockup review.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Contractor is responsible for quality control of the Work.
2. Manufacturer: A firm experienced in successfully producing work similar to that indicated for this Project, with a record of successful in-service performance, and with sufficient production capacity to produce required units without causing delay in the Work.

    a. Experience: Minimum of 5 years.

3. Installer: An installer trained in the use of the materials and equipment to be employed in the Work.

B. Regulatory Requirements: Comply with all applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals from all such authorities.

C. Single Source Responsibility: Obtain work from a single manufacturer.

D. Pre-Installation Meetings: Contractor to conduct meetings at site with installer prior to start of Work. Familiarize installer with conditions at site and related Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Deliver materials in manufacturer’s original packaging with label indicating pertinent information identifying the item. Store materials in accordance with manufacturer’s instructions in a protected dry location off ground. Do not open packaging nor remove labels until time of installation.

1. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other suitable protective covering.
2. Remove casework to be refinished from Owner's storage and transport to casework manufacturer's facility for refinishing, as directed.

1.7 PROJECT CONDITIONS OR SITE CONDITIONS

A. Environmental Requirements: Proceed with the Work in accordance with manufacturer's requirements and instructions and any agreements or restrictions of the Pre-Construction Conference.

B. Existing Conditions: Field measure at location of the Work prior to preparation of the shop drawings. Include measurements of adjacent construction to which the Work must fit. Coordinate construction to ensure that actual opening dimensions correspond to fabricated dimensions of the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 WOOD AND METAL LABORATORY CASEWORK

A. Manufacturers: Subject to compliance with requirements, provide one of the following.
1. Kewaunee Scientific Equipment Corporation, PO Box 1842, Statesville, NC 28687
2. Mott Manufacturing Ltd. 452 Hardy Road, P.O. Box 1120, Brantford, ON, Canada
3. CiF Lab Solutions., 53 Courtland Ave., Vaughan, Ontario, Canada

2.2 MATERIALS

A. Definition of cabinet components by surface visibility.

1. Exposed Surfaces:

a. Surfaces visible when drawers and solid doors are closed.
b. Surfaces visible behind clear glass doors.
c. Bottoms of cabinets 42" or more above finished floor.
d. Tops of cabinets less than 72" above finished floor.
e. Front rails.

2. Semi-Exposed Surfaces:

a. Surfaces which become visible when solid doors are open.
b. Bottoms of cabinets more than 30" but less than 42" above floor.
c. Tops of cabinets 72" or more above finished floor when visible from an upper level.

3. Concealed Surfaces:

a. Surfaces not normally visible after installation, with doors open.
b. Bottoms of cabinets less than 30" above finished floor.

B. Hardwood:

1. Hardwood lumber, clean and free of defects. All lumber kiln dried to uniform moisture content of six percent.

a. Exposed material – Maple.
b. Semi-exposed material - select hardwood.
c. Unexposed material - sound hardwood of species suitable for the intended purpose.

C. Plywood:

1. Hardwood plywood featuring a balanced construction glued with water resistant resin glue.

a. Exposed: 3-ply 45# particleboard core plywood including a face of maple veneer.
b. Semi-exposed: 3-ply 45# particleboard core plywood including a face of select hardwood veneer.
c. Unexposed: 7-ply veneer core plywood or 3-ply 45# particleboard core plywood including a face of sound grade hardwood veneer.

D. Welded fiberboard: Wood fibers and resin binders formed under heat and pressure.

E. Glass: 3mm, 6mm clear float with no imperfections or marred surfaces.

F. Glue: Type 2 or Type 3.

G. Finish: Highly chemical resistant acrylic urethane finish applied over stain of selected color, Refer to Interior Finish Schedule on Drawings for color.

H. Acrylic panels (plexiglass): ¼" (6mm) clear abrasion resistant acrylic sheet with abrasion resistant coating on both sides. (USP "Acrylite" or equal)

2.3 FABRICATION

A. Wood Casework:

1. General:

a. Design: Flush overlay, wood grain to run vertically.
b. Wood Species: White maple
c. Cut: Plain sliced
d. Matching: Provide veneers for each cabinet from a single flitch, book and running matched.

2. Wood Base Units:

    a. Cabinet ends – 3/4” thick, 7-ply veneer core plywood or 3-ply 45# particleboard core plywood with 3mm thick exposed hardwood facer on front edges. Bore interior faces, as appropriate, for security panels, rails, and four rows of shelf support holes. Provide four metal corner gusset levelers with threaded adjustment screws and floor pad on all base cabinets.
    b. Front top rail: L-shaped rail of two pieces of 3/4” hardwood. Grooved and glued together; solid maple for exposed member: 1-1/2” (vertical) x 2-1/4” for standing height units, and 2-5/8” x 2-1/4” for sitting height units. Secure to cabinet end with mortise and tenon, glued and screwed joints.
    c. Top horizontal rails at side and back: 1-1/2” x 3/4” hardwood, blind mortised and tenoned into front horizontal rail and back vertical rail, and glued in place.
    d. Vertical back top rails: 3/4” x 3-7/8” hardwood grooved for cabinet back; mortised, tenoned glued and pinned to cabinet ends and reinforced with glue blocks, bottom back support rail with levelers or particleboard core. Provide top side rails 1-1/2” x 3/4” hardwood between front horizontal and back vertical rail.
    e. Front bottom rail and toe space rail: 1-1/2” x 3/4” solid hardwood front bottom rail and 4-5/8” x 3/4” toe space rail, forming a 4” high x 2-1/2” deep toe space, closed to cupboard bottom. Secure rails to cabinet end panels with mortise and tenoned, glued and pinned joints. Plywood toe space rails are not acceptable.
    f. Base unit bottoms: 5/8” thick, 5-ply hardwood plywood; 9/16” thick maple veneered plywood in open units. Set flush, tenoned and grooved into cabinet ends and front bottom rail, pinned and reinforced with glue blocks.
    g. Cupboard unit backs shall be removable one piece 3/16” hardboard supplied on cupboard units. Provide split back on drawer cabinets of 3/16” hardboard.
    h. Vertical dividers: Full height dividers shall be 1-1/2” thick plywood. Provide 3mm thick hardwood facer on exposed edge.
    i. Base unit front and rear intermediate rails with security panels: None required except where keyed different locks are indicated on drawings. Provide intermediate hardwood 1-1/2” x 3/4” back rail and hardboard security panel between doors and drawers with locks only. Requirements for locks are noted on drawings.
    j. Shelves: 3/4” thick full depth, hardwood plywood, with front edge maple faced. Base unit shelves are to be adjustable on 32mm centers supported on metal pin and socket supports.
    k. Drawer construction: Drawer box back, and sides to be of 1/2 inch thick solid hardwood and bottom of 1/4” thick welded fiberboard.
    l. Drawer suspension: Mechanical slides shall be full extension 100# static and dynamic load, zinc plated Accuride 3832 series. Drawer slides to be warranted against defects in material or workmanship for as long as the original purchaser maintains ownership. Should a drawer slide fail it will be replaced at no charge.
    m. Drawer heads shall be 3-ply, 3/4” thick five ply maple veneer with solid hardwood core, joined to sides with lock shoulder joint, back to sides rabbeted glued and screwed.
    n. Doors: 3/4” thick hardwood framed, solid core, maple veneer both sides, five ply construction, flush overlay design.

3. Wood Wall Upper and Tall Cases:

    a. Shall be manufactured with appropriate materials and joinery methods as specified for base units.
    b. Upper and tall case tops and bottoms: 9/16” thick seven ply maple plywood for open cases with glazed doors; 5/8” thick hardwood plywood for cases with solid doors. Tenon and glue tops and bottoms into end, top, and bottom rail grooves and pin. All case bottoms shall be flush design; offset interior bottoms are not acceptable.
    c. Solid Doors: 3/4” thick three-ply construction with maple veneer on exterior and interior.
    d. Backs:, 1/4’’ thick maple veneered welded fiberboard.. Recess backs and set into tops and ends, pinned and reinforced with glue blocks.
    e. Framed-glazed doors: Solid engineered hardwood construction, 3/4” x 2-3/4” frame stock machined to accept glass. Provide extruded vinyl retaining molding designed so glass can be replaceable without tools. Meeting edges of pairs of doors to include overlapping astragals: right over left.
    f. Shelves: 1” thick, 9-ply veneer core plywood. Provide 1mm facer at front edge of all shelves. Unit shelves are to be adjustable on 32mm centers, supported on metal pin and socket supports.

4. Center bench shelving assembly:

    a. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members. Vertical supports shall be designed to allow space for integration of electrical services. All vertical members shall be one piece continuous from floor to underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop.
    b. Shelf Standards: Steel tubes shall be punched with slots on 1” centers to receive adjustable shelf brackets.
    c. Shelf Brackets: 16 gauge (1.6mm) bookend type as detailed on drawings.
    d. Safety edging: Front edge; retainer rail.
    e. Finish: Factory finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color as selected by the Architect from manufacturer’s full range.
    f. Shelving: Epoxy resin to match countertops.

B. Metal Casework

1. General
    a. Design: flush overlay
    b. Finish: Electrostatically coated with laboratory grade thermosetting powder coating

2. Metal Base, Wall Upper Cases
    a. General

1) Exterior corners: shall be spot and arc welded with heavy back up reinforcement at exterior corners. All face joints shall be arc welded and ground smooth to provide a continuous flat plane.
2) All units shall have a cleanable smooth interior. Front and rear posts, reinforcing members or channel uprights shall be enclosed full heights on all cabinet openings.
3) End Uprights shall be formed into not less than a channel formation at top, bottom, back and front.
4) The edge of the vertical uprights shall be formed to provide a strike for doors and drawers, and shall be perforated for the support of drawer channels, intermediate rails and hinge screws.
5) An upright filler shall be screwed in place in all cupboard units to close the back of the channel at front of the upright and to provide a smooth interior for the cupboard to facilitate cleaning.
6) The upright filler shall be perforated with shelf adjustment holes at no more than ½ inch (12.7 mm) centers.
7) The inside front of the upright shall be further reinforced with a full height 14 gauge (2.0 mm thick) hinge reinforcement angle.
8) Die Formed Gussets: shall be furnished in each bottom corner of base units to insure rigidity, and a 3/8 inch (10 mm) -16 leveling bolt, 3 inches (75 mm) long, shall engage a clinch nut in each gusset. Each leveling bolt and gusset shall be capable of supporting 500 lbs (225 kg). (Each unit shall support 2000 lbs. (900 kg) uniformly distributed on a work top.) Provide caps at all penetrations provided to access leveling devices.

b. Cabinet Base:

1) Case bottom and bottom rail shall be formed of one piece of metal except in corner units and shall have both sides and back formed up or down and shall be offset in front to provide a door and drawer recess rabbet.
2) Toe Space Rail: shall extend up and forward to engage bottom rail to form a smooth surfaced toe space, 3 inches (75 mm) deep and 4 inches (100 mm) high. Whenever the base is omitted for units to be set on building bases or separate metal bases, the toe space rail shall extend back 4½ inches (115 mm).
3) Cabinet Back, Unexposed: Cabinet back shall consist of a top and bottom rail, channel formed for maximum strength and welded to back and top flange of end uprights, with space between left open for access to plumbing lines. All units shall be provided with removable back panels.

   a) Sink units shall be provided with fixed half-height backs to allow plumbing lines to enter and exit the cabinet through the open area.

4) Shelves: shall be full depth formed down ¾ inch (19 mm), back 7/8 inch (22 mm) and up ¼ inch (6 mm) at front and rear and formed down at ends ¾ inch (19 mm). Shelves over 36 inches (914 mm) in length shall be additionally reinforced by a flanged channel shaped member electro-welded to underside

of shelf. Shelves shall be adjustable. Full depth is defined as a shelf whose front edge is within ½ inch (13mm) of the face of the cabinet when the shelf is fully back in the cabinet.

5) Doors: shall be readily removable and hinges easily replaceable. Hinges shall be applied to the case and door with screws. Welding of hinges to either case or door will not be acceptable.
6) Door and Drawer Heads:

   a) Metal, Flush Overlay: shall be a two-piece sheet steel assembly of ¾ inch (19 mm) overall thickness to consist of an inner pan formed as an extension of the drawer body, an outer pan having a channel formation on all four sides, and the interior space filled with a non-organic sound deadening material at the time of assembly. Door Pans and Drawer Heads shall be painted inside and out prior to assembly.
   b) All four corners of door and drawer heads shall be welded closed and ground smooth to eliminate exposure of raw edges and open gaps.
   c) Glazed Hinged Door Construction: Glazed swinging doors shall be 3/4" thick and consist of an inner and outer door pan welded to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, pierced for a glass opening in center of the door, with 16 gauge hinge reinforcements welded in place. Glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Outer door pan shall be prepared as necessary to accept attachment of pulls as specified elsewhere in this section.

7) Drawer Construction:

   a) Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and inner front. They shall be fully coved at interior bottom on all four sides for easy cleaning. Sides shall be full height with ½ inch (13 mm) clearance to frame opening. Drawers shall be a minimum of 18 inches front to back.
   b) Drawer Suspension: Refer to Drawer Slides under Hardware section.
   c) Drawer stops: shall be provided to insure smooth, quiet operation at point of contact with cabinet front.

8) Top Horizontal Rail: Provide on base cabinets such that rail shall interlock within the flange at top of end panels for strength. Reinforcements shall be provided at all front corners for additional welded strength between vertical and horizontal case members.

9) Intermediate Rails: Provide on base cabinets such that rails shall be provided between doors and drawers, but shall not be provided between drawers unless made necessary by locks in drawers. When required, intermediate rails shall

be recessed behind doors and drawer fronts, and designed so that security panels may be added as required.

10) Intermediate Vertical Uprights: shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers. However, to allow storage of large or bulky objects, no upright of any type shall be used at the center of double door cupboard units.

11) Security Panels: Provide security panels in frames between drawers and cabinets within a cabinet where keyed different locks are indicated.

12) Knee Space Service Strip Cover Panels where specified, shall be 18 gauge (1.3 mm thick) steel, of the same finish as cabinets, and shall be furnished at open spaces under counter top where no cabinets occur. They shall be easily removable and shall cover piping from underside of top of service ledge to floor.

13) Provide filler panels where required between cabinets, at corner intersections of cabinets, between cabinets and walls and wherever else required for a complete finished installation. For tall cabinets, filler panels shall be provided for vertical face and top. For wall cabinets, filler panels shall be provided for vertical face, top and bottom. Filler panels shall follow the profile of toe kicks.

3. Center bench shelving assembly:

   a. Steel Frame Support System: Provide cold rolled steel tube vertical and horizontal support members. Vertical supports shall be designed to allow space for integration of electrical services. All vertical members shall be one piece continuous from floor to underside of structure above or to top horizontal member as indicated on the drawings. Horizontal top and intermediate members shall be one piece between vertical members. Provide caps at all open ends of tube sections. Secure vertical members to floor slab, underside of benchtop.
   b. Shelf Standards: Steel tubes shall be punched with slots on 1” centers to receive adjustable shelf brackets.
   c. Shelf Brackets: 16 gauge (1.6mm) bookend type as detailed on drawings.
   d. Safety edging: Front edge; retainer rail.
   e. Finish: Factory finish steel tube support system, shelf standards, and brackets with epoxy powder coating. Color as selected by the Architect from manufacturer’s full range.
   f. Shelving: Epoxy resin to match countertops.

4. Hardware:

   a. Drawer and hinged door pulls shall be stainless steel wire pulls. Pulls on swinging doors to be mounted horizontally.
   b. Hinges: Stainless steel 5-knuckle institutional type. Provide two hinges for doors up to 48" high; three hinges for doors over 48" high. Notch for proper fit.
   c. Door catches: Adjustable type, spring actuated nylon roller catches.

d. Elbow catches: Spring type with strike.
e. Locks (where indicated) shall be 5-disc tumbler for master key system. Heavy duty cylinder. Exposed lock nose finish to be dull nickel (satin) plated, where shown on drawings.

1) Master Key System: Master key system shall have 5-disc tumbler locks with capacity for 225 primary key changes. Master key one level with the potential of 3 different, non-interchangeable master key groups.
2) Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:
3) 2 for each keyed different lock
4) 3 for each group keyed alike locks
5) 2 for master keys for each system.

f. Label holders shall be stainless steel finished 1" x 2-1/2" pinned to drawer on door fronts. One on each door and drawer.

C. Wood Finish:

1. Preparation: Sand exposed surfaces smooth, free from dirt and defects.
2. Stain application: Apply stain of color selected to all exposed casework surfaces. Apply in a manner to achieve a match with the selected color sample upon completion of application of the finish.
3. Finish application: Apply finish coats evenly force dry in a dust-free atmosphere, sand and wipe clean surfaces between coats to produce a smooth, satin luster finish. Surfaces exposed to view shall be water clear and bright. Cloudy, muddy finishes carrying tinting pigments will not be acceptable.
4. Finish schedule: See ID sheets for finish schedule

a. Apply an acrylic urethane finish to the following areas:

1) Exposed surfaces:

a) Multiple coats sanded between coats with final 1.5 dry mil thick, minimum, finish.

2) Semi-exposed surfaces:

a) Multiple coats with sanding between coats with final 1.0 dry mil thick, minimum, finish.

3) Concealed surfaces:

a) No finish required.

5. Chemical resistance: Manufacturer shall provide verification of resistance to chemical spills and splashes performed by independent testing agency. Test shall adhere to the following procedure.

a. Apply five drops of reagents as noted to vertically oriented test panel.
b. Test duration: 2 hours.
c. Observe and record results.

Minimum acceptable results of chemical resistance test:

Chemical	Performance Rating
ACIDS	
Acetic Acid 50%	NE
Acetic Acid 75%	NE
Acetic Acid, Glacial	EX
Formic Acid	EX
Hydrochloric Acid 37%	NE
Hydrofluoric Acid 48%	NE
Hydrogen Peroxide 30%	NE
Nitric Acid 30%	G
Phosphoric Acid 75%	EX
Sulfuric Acid 50%	EX
Sulfuric Acid 70%	EX
BASES AND SALTS	
Ammonium Hydroxide, 15%	NE
Ammonium Hydroxide, 20%	NE
Ammonium Hydroxide, 25%	NE
Glycerin	NE
Potassium Hydroxide, 25%	NE
Potassium Hydroxide, 35%	NE
Potassium Hydroxide, 45%	NE
Sodium Hydroxide, 40%	NE
Sodium Hydroxide, 50%	NE
Sodium Chloride, Saturated	NE
Sodium Carbonate, Saturated	NE
Sodium Hypochlorite, 5.25%	NE
Zinc Chloride, Saturated	NE
SOLVENTS	
Acetone	EX
Amyl Acetate	NE
Butyl Alcohol	NE
Cresol	G
Dimethyl Formamide	G
Dioxane	NE
Ethyl Acetate	NE
Ethyl Alcohol	NE
Ethyl Ether	NE
Formaldehyde	NE
Furfural	EX
Gasoline	NE
Kerosene	NE
Methyl Alcohol	EX
Methyl Ethyl Ketone	EX

Monochlorobenzene	NE
Napthalene	NE
Phenol	EX
Silver Nitrate, 10%	NE
Sodium Sulfide, Saturated	EX
Tincture of Iodine	G
Toluene	NE
Trichloroethylene	NE
Xylene	NE

Performance Ratings:

NE	No effect	No detectable change in surface material.
EX	Excellent	Slight detectable change in color or gloss, but no change to the function or life of the working surface material.
G	Good	A clearly discernible change in color or gloss, but no significant impairment of working surface function or life.
F	Fair	Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period of time.
FL	Failure	Pitting, cratering or erosion of working surface material. Obvious and significant deterioration.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine and correct conditions of area to receive the Work prior to installation.

3.2 INSTALLATION

A. General: Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the Work.

B. Casework:

1. Set casework components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.
2. Fasten continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance. Do not use self-tapping machine screws for this purpose.
3. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board. Blocking in wall by rough carpentry.
4. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

C. Work Surface:

1. Where required due to field conditions, scribe to abutting surfaces.
2. Secure joints in the field, where practicable, in the same manner as in factory, with dowels, adhesive or fasteners recommended by manufacturer.
3. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

D. Sinks: Sinks shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations.

E. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations. Turn screws to seat flat; do not drive.

3.3 ADJUSTING

A. Repair or remove and replace defective work, as directed by (Architect/Owner) upon completion of installation.

B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly.

3.4 CLEANING

A. Construction Waste Management:

1. At the end of each work day, recycle or dispose of unused material, debris and containers in accordance with Division 1 Section “Construction Waste Management”.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to the Architect.

C. Clean countertops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

3.5 DEMONSTRATION

A. Factory trained manufacturer representative shall provide demonstrations to Owner’ staff.

3.6 PROTECTION

A. Protect the Work so it will not deteriorate or be damaged. Remove protection at time of Substantial Completion.

B. Advise contractor of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

3.7 SCHEDULES – See Drawings, LF1-1

END OF SECTION 12 3450