DANA-FARBER CANCER INSTITUTE - DANA 14 RENOVATION
450 Brookline Ave., Boston, MA

PROJECT MANUAL
Issued for Bidding

Prepared by:

E4H ENVIRONMENTS FOR HEALTH ARCHITECTURE
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PART 1 - GENERAL

1.1 PROJECT IDENTIFICATION

A. Project Name: Dana-Farber Cancer Institute - Dana 14 Renovation

B. Project Number: 2017069

C. The Owner, hereinafter referred to as Owner:
   1. Dana-Farber Cancer Institute
      450 Brookline Avenue
      Boston, MA  02215

D. Project Description:
   1. The project consists of the renovation to the entire 14th floor of the Dana Building at the Dana-Farber Cancer Institute. The scope of work will include a full floor renovation which will consist of renovations and upgrades to wet and dry labs, tissue culture rooms, lenti viral rooms, equipment core upgrades and office upgrades. The project will also include associated MEP/FP and low voltage (IT/AV/Sec) engineering services. Refer to Drawings for additional information. The project will not pursue LEED certification, refer to Article titled Project Environmental Goals Article herein below.

1.2 PROJECT ENVIRONMENTAL GOALS

A. Pollution prevention:
   1. Utilize pollution prevention materials, sustainable construction methods, low VOC and non-off-gassing products to maintain of healthy Indoor Air Quality (IAQ) during the construction process:
      a. Incorporate green products and sustainable materials into the Project. To the greatest extent possible, the Contractor shall:
         1) Use products with low embodied energy (production, manufacturing, and transportation).
         2) Use products that maximize recycled content in materials products, and systems.
         3) Use products easy to maintain, repair, and that can be cleaned using non-toxic substances.
         4) Use products will not negatively affect healthy indoor air quality.
         5) Use reusable and recyclable packaging.
         6) Avoid use of ozone-depleting compounds, such as HCFCs from refrigerants or foam insulation materials.

B. Water resource protection:
   1. Conserve and use water efficiently, limit on-site fresh water usage to the greatest extent possible, control water distribution systems and waste, minimize use of imported or mined water. Utilize water-conserving appliances and equipment.

C. Air Quality:
   1. Air Quality shall be achieved by compliance with the limitation of indoor air concentrations of certain pollutants, at or below the established maximum allowable concentrations. Healthy air quality goals shall be maintained during construction, and through building commissioning.
   2. Use construction practices that achieve the most efficient use of resources and materials.

D. Recycling goals and waste management program intent:
   1. Refer to Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.3 PROJECT CONSULTANTS

A. Refer to Section 000103 - PROJECT DIRECTORY.
SECTION 000103
PROJECT DIRECTORY

PART 1 - GENERAL
PROJECT TITLE
Dana-Farber Cancer Institute - Dana 14 Renovation

TEAM DIRECTORY

Owner:
Dana-Farber Cancer Institute
450 Brookline Avenue
Boston, MA  02215

Architect:
E4H Environments for Health Architecture
23 Drydock Ave., Suite 23-610W
Boston, MA  02210
Contact: Luke Thiboutot, Senior Associate
Phone: 617.772.0260
Email: lthiboutot@e4harchitecture.com

MEP/FP Engineer:
AKF Group LLC
99 Bedford Street
Boston, MA  02135
Phone: 617.737.1111

IT Planning/Engineer:
e3i Engineers, Inc.
137A Lewis Wharf
Boston, MA  02110
Phone: 617.530.1104

Construction Manager:
TBD

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

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END OF SECTION
SECTION 011000
SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Project team.
   3. Definitions.
   5. Existing conditions and measurements.
   6. Verification of existing conditions
   7. Contractors use of site and premises.
   8. Work sequence

1.2 PROJECT INFORMATION

A. Project Identification: Dana-Farber Cancer Institute - Dana 14 Renovation, Project No. 2017069.
   1. Project Location:
      Dana-Farber Cancer Institute, Dana Bldg. 14th Floor
      450 Brookline Avenue
      Boston, MA 02215

   2. Project Description: Refer to Section 000102 - PROJECT INFORMATION.

1.3 PROJECT TEAM - REFER TO SECTION 000103 - PROJECT DIRECTORY.

1.4 DEFINITIONS

A. Approved: The term approved, when used in conjunction with the Architect's action on contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.

C. Furnish: The term furnish means supply and deliver to the Project site, unloaded, unpacked, inspected for damage, and ready for assembly, installation, and similar operations.

D. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.

E. Install: The term install describes operations at the Project site including the actual assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

F. Installer: An Installer is the Construction Manager or another entity engaged by the Construction Manager, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform, having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

G. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.
H. **Project site**: Is the space available to the contractors for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is as defined by the Owner and Project Coordinator.

I. **Provide**: The term provide means to furnish and install, complete and ready for the intended use.

J. **Testing Agencies**: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.5 **WORK COVERED BY CONTRACT DOCUMENTS**
A. The Work of Project is defined by the Contract Documents.
B. Type of Contract: Project will be constructed under a single prime contract.

1.6 **EXISTING CONDITIONS & MEASUREMENTS**
A. Information pertaining to the project site has been obtained through casual field observations and existing record documents and is indicated on the Drawings and in the Project Manual. This information has been gathered with reasonable care but is of a schematic nature and is not warranted. Verify all dimensions in the field prior to ordering materials or construction.
B. Be alert to any indication or evidence of existing building conditions not indicated in the Contract Documents. Measurements shall be verified from actual observation at the project site. If unexpected existing conditions are encountered, cease operations immediately and notify the Architect.
C. Cost of unavoidable initial damage and such supplemental and remedial work that is ordered by the Architect shall be borne by the Owner in accord with the General Conditions.
D. Contractors shall bear the cost of damage resulting from their failure to exercise reasonable care in their work or from continuing operations without notifying the Architect.

1.7 **VERIFICATION OF EXISTING CONDITIONS**
A. All dimensions, elevations, and conditions of all existing construction shall be verified in the field by contractors prior to submitting shop drawings. Upon receipt of shop drawings, the Architect has the right to assume that all field dimensions, elevations, and conditions have been verified by the contractor submitting the drawings and that the shop drawings accurately reflect such verifications unless stated otherwise on the shop drawings.

1.8 **CONTRACTORS USE OF SITE AND PREMISES**
A. Construction Operations: Limited to areas as defined by Owner's Representative.
B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by others.
   3. Work by Owner.
   4. Use of adjacent portions of the site and premises by the public.
C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.
D. Use of the Existing Building:
   1. Maintain the existing building in a weather tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.
   2. Existing building spaces (outside of the construction limits) may not be used for storage.
E. Time Restrictions:
1. Limit conduct of especially noisy, malodorous, and dusty exterior and interior work to the hours of 8:00 a.m. to 5:00 p.m.
2. Contractors may be required to stop or limit work at certain times based on Owner operations.
   a. Limit conduct of especially noisy interior work to the times of day acceptable to the Owner.
   b. Contact Owner prior to beginning especially noisy work.
3. Contractors shall perform certain work at times as necessary to minimize disruptions of the Owner's facility, including evenings, nights and weekends.
   a. For additional work required to keep disruptions of the Owner's existing facility to a minimum as requested by the Owner, the Owner will pay only for the additional cost above the normal rates for premium time required to complete the work.
4. Perform additional work required to meet established Contract time limits after regular working hours (7:00 AM to 5:00 PM) or, after notification of the Owner, on Sundays or on legal holidays as necessary. Deviations from this restriction require approval in writing from the Owner.

F. Utility Outages and Shutdown:
1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
2. Limit shutdown of utility services to 4 hours at a time, arranged at least 96 hours in advance with Owner.
3. Prevent accidental disruption of utility services to other portions of the facility.

G. Smoking Policy:
1. All construction personnel and employees of the contractors shall strictly observe the Owner’s smoking policy. Smoking shall be prohibited on or adjacent to the Owner’s property by all personnel.

1.9 WORK SEQUENCE
A. Coordinate construction schedule and operations with Owner’s Representative.

1.10 DIVISION 1 SPECIFICATION SECTIONS APPLICABLE TO ALL CONTRACTS
A. Unless otherwise noted, all provisions of the Division 1 sections, that are part of this Project Manual and as listed on the Table of Contents, apply to all contracts. Specific items of work listed under individual contract descriptions constitute exceptions.

1.11 DRAWING CONVENTIONS
A. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations as scheduled on Drawings.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.12 PROJECT MANUAL FORMATS AND CONVENTIONS
A. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
   1. Section Identification: Six/Eight digit Section numbers are utilized and cross-referenced throughout the Contract Documents. Sections in the Project Manual are in numeric
sequence; however, the sequence is incomplete because only those Section numbers which are applicable to this Project are used.

2. Division One of the Project Manual governs procedural and administrative requirements of the Work. Division One requirements are applicable to all Sections and Documents in the Project Manual.

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

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

2. Imperative mood and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the contractors. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by the contractors or by others when so noted.

3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Procedures for preparation and submittal of applications for progress payments.
C. Change procedures.
D. Correlation of Construction Manager submittals based on changes.
E. Procedures for preparation and submittal of application for final payment.

1.2 SCHEDULE OF VALUES
A. Form to be used: AIA G703 - Application and Certificate for Payment Continuation Sheet.
B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
C. Forms filled out by hand will not be accepted.
D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify bonds and insurance.
F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.3 APPLICATIONS FOR PROGRESS PAYMENTS
A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Form to be used: AIA G702 and G703.
C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
D. Forms filled out by hand will not be accepted.
E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of Work.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   10. Retainage.
F. Execute certification by signature of authorized officer.
G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
I. Submit electronic copies of each Application for Payment.
J. Include the following with the application:
1. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from sub-contractors or sub-sub-contractors and suppliers for the construction period covered by the previous application.
   a. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
   b. When an application shows completion of an item, submit final or full waivers.
   c. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
   d. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.

2. Transmittal letter as specified for submittals in Section 013000.

K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.4 INITIAL APPLICATION FOR PAYMENT

A. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
   1. List of sub-contractors.
   2. List of principal suppliers and fabricators.
   3. Schedule of Values.
   4. Construction Schedule (preliminary, if not final).
   5. Schedule of principal products.
   6. Schedule of unit prices.
   7. List of Construction Manager's staff assignments.
   8. Certificates of insurance and insurance policies.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Construction Manager's employ or subcontractors of changes to Contract Documents.

B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.

C. For other required changes, Architect will issue a document signed by Owner instructing Construction Manager to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Construction Manager shall prepare and submit a fixed price quotation within 10 days.
   1. Such request is for information only, and is not an instruction to execute the changes, or to stop work in progress.

E. Construction Manager may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 016000.
F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Construction Manager's price quotation.
   2. For change requested by Construction Manager, the amount will be based on the Construction Manager's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Construction Manager, the amount will be determined by Architect based on the Construction Manager's substantiation of costs as specified for Time and Material work.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Administrative actions and submittals that shall proceed or coincide with this application include:
   1. Occupancy permits and similar approvals.
   2. Changeover information related to Owner's occupancy, use, operation and maintenance.
   3. Application for reduction of retainage, and consent of surety.
   4. Advice on shifting insurance coverages.
   5. List of incomplete Work, recognized as exceptions to Architect’s Certificate of Substantial Completion.

1.7 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 017000 - Execution and Closeout Requirements.
2. All closeout submittals specified in Section 017800 - Closeout Submittals have been received and approved.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. This Section consists of:
1. General provisions for allowances.
2. Description of cash allowances.

1.2 GENERAL PROVISIONS
A. Work performed on an allowance basis shall be included in the Base Bid - Stipulated Sum or in a Bid Alternate as specified. Whenever the actual cost is more than or less than the allowance, the Contract shall be adjusted accordingly by Change Order. Procedures for submitting and handling Change Orders are included in the General Conditions.
1. Except as otherwise specified herein, or under individual specification Sections, the allowance shall include the cost of all materials and equipment required, delivered and installed, less any applicable trade discount and plus all applicable taxes.

B. Cash allowance provisions:
1. Costs included in cash allowances: Cost of product to General Contractor or subcontractor, less applicable trade discounts; delivered to site and applicable taxes.
2. Architect responsibilities:
   a. Consult with General Contractor in consideration and selection of products and suppliers.
   b. Select products in consultation with Owner, and inform General Contractor of decision.
   c. Prepare Change Order.
   d. General Contractor Responsibilities:
      1) Assist Architect in selection of products and suppliers.
      2) Obtain proposals from suppliers and offer recommendations.
      3) On notification of selection by Architect execute purchase agreement with designated supplier.
      4) Arrange for and process shop drawings, product data and samples. Arrange for delivery.
      5) Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
   e. Funds will be drawn from Cash Allowances only by Change Order.

1.3 CASH ALLOWANCES DESCRIPTION
A. Cash Allowance 1 - Custom image on glass:
   1. Hold $1500 per image x 2 = $3,000 for image rights as described in Division 08. Custom image shall be approved by the Architect and located as indicated on the Drawings.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL
1.1 SUMMARY
A. Preconstruction meeting.
B. Progress meetings.
C. Construction progress schedule.
D. Progress photographs.
E. Coordination drawings.
F. Submittals for review, information, and project closeout.
G. Submittal procedures.
   1. Submittal coordination.
   2. Schedule of submissions.
   3. Submittal procedures and grading.
   4. Submission requirements and quantities.
   5. Shop drawings, product data and samples.
   6. Manufacturer’s instructions and certificates.
   7. Emergency addresses.

1.2 RELATED REQUIREMENTS
A. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
B. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 PROJECT COORDINATOR
A. Cooperate with the Owner's Representative in allocation of mobilization areas of site; for field offices and sheds, for material access, traffic, and parking facilities.
B. During construction, coordinate use of site and facilities through the Owner's Representative.
C. Comply with Construction Manager's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
D. Comply with instructions of the Construction Manager and Owner's Representative for use of temporary utilities and construction facilities.
E. Coordinate field engineering and layout work under instructions of the Construction Manager.
F. Make the following types of submittals to Architect through the Construction Manager:
   1. Requests for Interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Closeout submittals.
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Construction Manager shall schedule meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   3. Construction Manager.
   4. Subcontractors and major suppliers.
      a. Representatives of Subcontractors and suppliers attending meeting shall be qualified and authorized to act on behalf of the entity each represents.
   5. Others as appropriate.

C. Agenda:
   1. Submission of executed bonds and insurance certificates.
   3. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
      a. Tentative construction schedule.
      b. Critical work sequencing.
      c. Equipment deliveries and priorities.
   7. Use of premises.
      a. Working hours.
      b. Work, office, and storage areas.
      c. Construction facilities, controls, and construction aids.
      d. Temporary utilities.
      e. Security procedures.
   8. Safety and first-aid procedures.

D. Construction Manager to record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

A. Construction Manager to schedule and administer meetings throughout progress of the Work at maximum bi-weekly intervals.

B. Construction Manager to make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
   1. Representatives of Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
   2. The Architect and the Owner's Representative may attend meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

D. Agenda:
   1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Review of Building Enclosure Work progress with Commissioning Agent and appropriate team members.
13. Other business relating to Work.

E. Construction Manager shall record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

F. Pre-Installation Conferences: Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect/Engineer of scheduled meeting dates.

3.3 CONSTRUCTION PROGRESS SCHEDULE
A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.
C. Within 10 days after joint review, submit complete schedule.
D. Submit updated schedule with each Application for Payment.

3.4 PROGRESS PHOTOGRAPHS
A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
B. Photography Type: Digital; electronic files.
C. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect.
D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Completion of site clearing.
   2. Excavations in progress.
   3. Foundations in progress and upon completion.
   4. Structural framing in progress and upon completion.
   5. Enclosure of building, upon completion.
   7. Final completion, minimum of ten (10) photos.
E. Take photographs as evidence of existing project conditions.
F. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Submit with applications for payment.
   2. File Naming: Include project identification, date and time of view, and view identification.
3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.5 COORDINATION DRAWINGS
A. Provide information required by Project Coordinator for preparation of coordination drawings.
B. Review drawings prior to submission to Architect.

3.6 SUBMITTAL COORDINATION
A. General: The Construction Manager is fully responsible for delay in the delivery of materials, progress of the Work, and damages incurred due to contractor’s failure to submit, revise and resubmit submissions in accordance with the requirements herein, and in a coordinated and timely manner to allow the Architect proper time for checking and processing of each submission or resubmittal.
B. Make submittals in a proper and timely fashion, allowing for administrative procedures, Architect’s review, corrections to submissions and resubmittal, if necessary, and fabrication of products without delaying the project. Minimum processing times required by the Architect are as follows:
   1. Review for Architect’s Office Only: Allow a minimum of 10 working days for review and processing. Some submittals may require additional time.
      a. Simultaneous submission of a large number of shop drawings and product data may require longer than 10 working days for review.
      b. Complex Systems (structural, mechanical, electrical) may require longer than 10 working days for review each time shop drawings, layout drawings, and product data are submitted or resubmitted.
   2. Review by Architect and its Consultant(s): Allow 10 working days for review and processing of submittals by Architect plus an additional 5 working days for review by each consultant as applicable.
   3. Reprocessing of Submittals: For submittals requiring resubmittal, re-processing time required shall be the same as first submittal.
   4. No extension of Contract Time will be authorized due to failure to transmit submittals sufficiently in advance of scheduled performance of Work.
C. Make submittals of similar items, systems, or those specified in a single specification section together.
D. Make submittals for products which other products are contingent upon, first.

3.7 SCHEDULE OF SUBMISSIONS
A. Schedule Procedure: Immediately after being awarded the Contract, meet with the Architect to discuss the schedule of submissions and then prepare and submit within 14 calendar days for approval a schedule of submissions for the Work. The schedule of submissions shall be related to the entire Project, and shall contain the following:
   1. Shop Drawing schedule (for shop and setting drawings to be provided by the contractors).
   2. Sample schedule (for samples to be provided by the contractors).
   3. With respect to portions of the Work to be performed by subcontractors, such schedule of submissions for the work of each subcontractor shall be submitted for approval within 30 calendar days after execution of a contract with such subcontractor.
B. List all submissions required of each trade.
   1. Include the Specification Section number, name of contractor or vendor, submittal type, item, description, type, quantity and size (where applicable) of each submission.
   2. For each submission, provide the following dates, as estimated:
      a. Scheduled date of submission.
      b. Required date of approval (permit time for appropriate review and resubmissions as may be required).
      c. Estimated date of beginning fabrication or manufacture of product (where applicable).
d. Required date of submission of product to testing laboratory.

e. Required date of testing laboratory approval.

f. Required date for delivery of product to site.

g. Required date for beginning of installation of product.

h. Required date for completion of installation (and in-place testing).

C. For each submittal, schedule to allow adequate time for review by the Architect and its consultants. The Architect will not be responsible for Work performed in shop or field prior to approval. Long-lead items requiring expedited action must be clearly indicated.

1. The schedule shall be reviewed and resubmitted as necessary to conform to approved modifications to the construction Project Schedule, and shall be updated as may be required by the Architect.

D. Posting of Submittal Schedule: Print and distribute the submittal schedule to Architect, Owner, contractors and other parties affected. Post copies in field.

E. Update schedule throughout progress of the Project, coordinated with scheduling changes in the Work, and redistribute monthly in conjunction with submittal of Application for Payment.

3.8 SUBMITTAL PROCEDURES AND GRADING

A. Prepare and submit to the Architect the following:

1. Construction Schedule.

2. Schedule of Values.

3. Schedule of shop drawings, product data, and samples.

B. Provide space for Construction Manager, Architect and engineering consultant review stamps, on the front page of each item's submittal copy. Apply Construction Manager's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and the Contract Documents. The Architect's stamp shall contain the following data (Engineering consultant review stamps may vary in language, but intent of language is similar):

<table>
<thead>
<tr>
<th>Stamp Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>REVIEWED</td>
<td>REVIEWED - No corrections, no marks.</td>
</tr>
<tr>
<td>FURNISH AS CORRECTED</td>
<td>FURNISH AS CORRECTED - Minor corrections required are as noted; all items can be fabricated as noted, without further correction and resubmission of original submission; checking is complete and all corrections are deemed obvious without ambiguity.</td>
</tr>
<tr>
<td>REVISE AND RESUBMIT</td>
<td>REVISE AND RESUBMIT - Resubmission is required; checking may be incomplete; details of items noted by checker are to be clarified further before full review can be given. Correct and resubmit, do not fabricate noted items requiring correction.</td>
</tr>
<tr>
<td>SUBMIT SPECIFIED ITEM</td>
<td>SUBMIT SPECIFIED ITEM - Submission has been rejected by Architect previously, and the currently submitted product is rejected as not being in accord with the Contract Documents, or other justifiable reasons. Submission using specified product is required.</td>
</tr>
<tr>
<td>REJECTED</td>
<td>REJECTED - Submittal is rejected as not in accord with the Contract Documents, too many corrections, or other justifiable reasons. When returning submission, Architect will state reasons for rejection. Correct and resubmit, do not fabricate.</td>
</tr>
</tbody>
</table>

1. The Architect will insert the date of action taken and an identification of the person taking the action.

2. Submittal grading:

   a. REVIEWED - No corrections, no marks.

   b. FURNISH AS CORRECTED - Minor corrections required are as noted; all items can be fabricated as noted, without further correction and resubmission of original submission; checking is complete and all corrections are deemed obvious without ambiguity.

   c. REVISE AND RESUBMIT - Resubmission is required; checking may be incomplete; details of items noted by checker are to be clarified further before full review can be given. Correct and resubmit, do not fabricate noted items requiring correction.

   d. SUBMIT SPECIFIED ITEM - Submission has been rejected by Architect previously, and the currently submitted product is rejected as not being in accord with the Contract Documents, or other justifiable reasons. Submission using specified product is required.

   e. REJECTED - Submittal is rejected as not in accord with the Contract Documents, too many corrections, or other justifiable reasons. When returning submission, Architect will state reasons for rejection. Correct and resubmit, do not fabricate.

3. Review/approval neither extends nor alters any contractual obligations of the Architect, Engineer or Construction Manager.
C. Identify all variations from Contract Documents, and product or system limitations which may be detrimental to successful performance of the completed work.

D. Construction Manager’s Review: Review all shop drawings, product data and samples. Include, without limitation, verification of the following:
   1. Proper title, original date, drawing number (which shall be changed if resubmitted), revision numbers and dates, designation of project Construction Manager, contractor and/or supplier.
   2. Identification of Shop Drawings, Product Data or Samples by Specification Section and subsection or paragraph where appropriate and identification of Contract Drawings by number and detail.
   3. On each submittal, as a minimum, Construction Manager shall identify the following:
      a. Errors, inconsistencies, and omissions discovered in the contract documents and field conditions must be reported at once to the Architect.
      b. Any variations from code requirements contained in the contract documents must be reported promptly in writing to both the Architect and Owner.
      c. Promptly report to the Architect information that any design, process, or product infringes on a patent.
      d. Names of contractor(s) and supplier(s). Include name(s) of contact person(s), address, telephone and fax number(s).

E. Revise and resubmit submittals as required, identify all changes made since previous submittal. Distribute copies of reviewed submittals to concerned parties; instruct parties to promptly report any inability to comply with provisions.

3.9 SUBMISSION REQUIREMENTS AND QUANTITIES

A. General: The Architect has adopted the use of Procore for the exchange and storage of files related to this Project. All submissions (except physical samples) shall be processed through the Procore project management system.

B. Furnish Architect with electronic files using the Adobe Acrobat Portable Document Format (PDF) for each of the following submittal types:
   1. Schedules
   2. Shop drawings.
   3. Product data, manufacturer’s instructions and certificates and similar submissions.
   4. Emergency addresses: 1 file to Architect, and 1 file direct to Owner.

C. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

D. Transmittal of submittals to Architect shall provide the following:
   1. Transmittal shall Identify Project, Construction Manager, contractor, installer, or supplier, pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate. Transmittals received by the Architect from sources other than the Construction Manager will be returned without any action taken.
   2. Construction Manager shall number submittals sequentially by Specifications Section prior to submittal. Resubmitted items shall retain number and be noted as resubmitted (example 260000-1 R1).

E. Furnish Architect with 3 identical samples for each physical sample submittal.

F. General Submission of Physical Submittals: Deliver to Architect at the following address:
   [Address information provided]

E4H Environments for Health Architecture
23 Drydock Ave., Suite 23-610W
Boston, MA  02210
Contact:  Luke Thiboutot, Senior Associate
Phone:  617.772.0260
Email:  lthiboutot@e4harchitecture.com
3.10 SHOP DRAWINGS

A. General: Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project. Shop drawings shall include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Standard information prepared without specific reference to this Project is not considered to be shop drawings.

1. Show adjacent conditions and related work. Show accurate field dimensions where appropriate.
2. Identify materials and products shown. Note all conditions where require coordination with other trades and special installation procedures.
3. Show gage and thickness of materials.
4. Indicate welding details and joint types.
5. Show every component of fabricated items, notes regarding manufacturing process coatings and finishes, identifying numbers conforming to the Contract Documents (i.e. stair numbers, door numbers and similar items), dimensions, and appropriate trade names.
6. Show anchorage and fastening details, including type, size and spacing.
7. Review each submittal for conformity with the Contract requirements prior to submittal, certify such review on each shop drawing with Construction Manager’s stamp, signature and date. Reference on shop drawings to other sections, installers, suppliers, or trade(s) shall designate the appropriate specification sections, and the term "by others" shall not be used.

B. Size of Format: Not less than 8-1/2 by 11 inches, and no larger than 30 by 42 inches, except for templates, patterns and similar full-size drawings.

C. The Architect’s comments and corrections will be made on the submittal and returned to the Construction Manager. If necessary, the Construction Manager then shall make the necessary corrections on the original documents and resubmit the corrected drawings in the manner specified. The Construction Manager is responsible to furnish (at no additional cost to Owner) all prints needed for use by the Construction Manager, contractors, installers, vendors and suppliers.

D. Drawing submittals returned "REVIEWED" or "FURNISH AS CORRECTED": Distribute adequate copies for construction, including one copy of each for designated Owner’s and Architect’s Project Representative(s), and then return the originals to the contractor or supplier from whom they originated.

E. Drawing submittals returned "REJECTED" or "REVISE AND RESUBMIT": Retain a record copy, and then forward originals to source for correction; resubmit new documents as specified herein above.

F. Shop Drawings returned "NOT REVIEWED": Retain a record copy, and return originals to source; do not resubmit.

G. Each drawing shall have a title block on the right hand side containing the following data:

Name of project - Dana-Farber Cancer Institute - Dana 14 Renovation
Architect - E4H Environments for Health Architecture
Construction Manager - TBD
Contractor/supplier - TBD
Date of submission - TBD

H. Each drawing shall have a clear space on the right hand side for review stamps of both the Architect and Construction Manager.

1. The Construction Manager’s Review and Action Stamp: Provide suitable space on label or title block for Construction Manager’s review and action stamp. Stamp and sign each submittal to show Construction Manager’s review and approval prior to transmittal Architect. Submittals not signed and stamped by Construction Manager will be returned without action.
a. Only submittals received from the Construction Manager will be considered for review by the Architect. Construction Manager shall review each submittal for accuracy and conformance with the requirements of the Contract Documents, and particularly for field measurements and proper fit with adjoining work. Modify submittals as required to show interface with adjacent work and attachment to Building.

b. The Construction Manager’s Review and Action Stamp shall contain the following language or similar:

```
APPROVED FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS.
All dimensions and quantities have been reviewed and are accepted by __________________________________________
Construction Manager’s Name
All dimensions and field conditions have been or will be verified prior to fabrication of the items described herein.
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c. Submittals received from the Construction Manager shall be signed and comply with review requirements. Submittals not certified or improperly certified (stamped but not reviewed) will be returned to the Construction Manager without Architect’s review. Claims due to the return of uncertified, improperly prepared or inadequately reviewed submittals will be rejected.

3.11 PRODUCT DATA
A. Submit Product data as specified, and as the Architect may additionally prescribe. Product data includes, but is not limited to:
   1. Catalog cuts.
   2. Complete specifications.
   4. Performance data.
      a. Compliance with recognized trade association standards.
      b. Compliance with recognized testing agency standards, labels and seals.
   5. Environmental data including, but not limited to:
      a. Chemical composition.
      b. VOC content.
      c. Material certifications as applicable to product.
   6. Certified laboratory test report data.
   8. Illustrated capacities, characteristics, wiring diagrams, controls, and other pertinent information for complete product and product use description.

B. If more than one size or type is shown on any printed sheet, indicate clearly intended item(s).

C. No copies stamped REJECTED or RESUBMIT shall be sent to the job site.

3.12 SAMPLES
A. Submit samples clearly labeled as to its material, type or make, manufacturer, size or gage, and other pertinent data, accompanied by an appropriate transmittal form. Samples shall show full range of color and texture variation that can be expected. When accepted or not accepted, the Architect will retain one set of samples and return the others to the Construction Manager. Construction Manager to keep one set of samples as a record copy for Owner. Samples will not be permitted for use in the project.

3.13 MANUFACTURER’S INSTRUCTIONS
A. When specified in individual specification Sections, submit manufacturer’s printed instructions for delivery, handling, storage, assembly, installation, start-up, adjusting, and finishing.

B. Identify conflicts between manufacturer’s instructions and Contract Documents.
3.14 MANUFACTURER’S CERTIFICATES
   A. When specified in individual specification Sections, submit manufacturer’s certificates and installer certificates to Architect for review.
   B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.
   C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

3.15 EMERGENCY ADDRESSES
   A. Within 15 days of Notice to Proceed, submit in writing, the name, addresses and telephone numbers of key members of their organization including Construction Manager’s Superintendent and personnel at the site, to be contacted in the event of emergencies at the building site, which may occur during non-working hours.

END OF SECTION
SECTION 013350
COORDINATION DRAWINGS AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Related Documents and Sections.
   2. Definitions.
   4. Structural, Mechanical and Electrical and Electrical Coordination.
   5. Contractor Responsibilities.
   7. Submittal Requirements.

B. RELATED DOCUMENTS AND SECTIONS
   1. Section 013000 - Administrative Requirements:
      a. Record Documents (As-Builts).
      b. Submittal Procedures.
      c. Project Management and Coordination.

C. DEFINITIONS
   1. Coordination Drawings - Contractor-prepared drawings submitted by Contractor to Owner to demonstrate: (1) The coordination of methods, materials, equipment, systems, plans, or sequence the Contractor proposes to use when limited space is available for installation of different components; (2) The coordination required for installation of Products and materials Fabricated by separate entities; and (3) The relationship of components shown on separate Shop Drawings or Submittals, when coordination among these components is required.

D. SCOPE
   1. Coordination of Utility Systems, including piping and equipment, in above-ceiling spaces, utility chases and utility rooms.
      a. The Contract documents are generally diagrammatic in nature with respect to mechanical, electrical, Fire Protection, and security/voice data systems. Not every bend, offset and direction change is shown in the Contract Documents. The Contract Documents represent that these systems will fit in the spaces allotted; however, it is the responsibility of the Contractor to assign space priorities and lay out and route the systems so they will fit efficiently in the allotted spaces and allow for convenient and code-conforming access to all valves, dampers and other devices.
      b. The layout of utility rooms is also diagrammatic in nature. The Contract Documents represent that that equipment identified to be installed in utility rooms will fit in the spaces allotted. However, because the Contractor must submit and provide for equipment to be installed in utility rooms, it is the Contractor’s responsibility to lay-out the equipment room such that all equipment will fit.
      c. The Contractor must examine all of the Contract drawings, especially architectural for ceiling space dimensions, and structural for beam/column obstructions, and make allowances in the Contractor’s planned coordination efforts, work sequence, and routing of the systems.
      d. Routing shown for pipes, ducts, and conduits on Drawings are shown by graphic symbols only; make runs parallel with lines of building.
      e. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
      f. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated; coordinate locations of fixtures and outlets with finish elements.
2. Contractor shall prepare Coordination Drawings in order to resolve potential installation and constructability problems prior to Installation so that construction cost and schedule are not impacted.
   a. Pricing of Coordination Drawings. The Contractor shall include, as a separate line item in the Schedule of Values (see Section 01290) the line item value for preparation of Coordination Drawings.
   b. Unless otherwise specifically stated in the Contract Documents, or needed for proper coordination of the installation of early Work, all Coordination Drawing Submittals are due no later than 150 Days after the Start Date stated in the Notice to Proceed.
   c. Coordination Drawings shall include dates and signatures of the Contractor and all Subcontractors whose work occurs in the space; signed Coordination Drawings shall be subject to examination by the Owner at any time.
   d. Contractor shall require Subcontractors to develop Subcontractor Coordination Plans of the same scale as Contractor’s Coordination Drawings to assist in making transcripts for transfer to Coordination Drawings; use approved Shop Drawings for Coordination Drawings.
   e. Unless a longer period is specifically stated elsewhere in the Contract Documents, allow at least 21 Days for Owner’s review and return of all Coordination Drawings Submittals and resubmittals. (See Section 01300 - Administrative Requirements.
   f. Revise Coordination Drawings when contract change orders are issued which affect Work indicated in Coordination Drawings, and as subsequent work is added to areas containing existing work.
   g. As part of the As-built drawing submittal, submit final Coordination drawings reflecting Work incorporated by .6.
   h. Coordination Drawings shall clearly show:
      1) The layout and routing of mechanical, electrical, Fire Protection, and security/voice data systems in above-ceiling spaces, utility chases, raised flooring (if applicable), other interstitial spaces, and underground ducts. Elements to include in Coordination Drawings include:
         (a) Mechanical ducts and pipes, including floor penetrations;
         (b) Plumbing pipes, including supply and gravity drain lines;
         (c) Fire branch lines and sprinkler heads;
         (d) Electrical bus ducts;
         (e) Voice/data cable trays and conduits;
         (f) Interstitial space access;
      (1) Identification and resolution of Interfering Structural elements: beams, columns, slabs, hangers, bracing, etc. and mechanical/electrical systems;
      (2) Identification and resolution of conflicts with mechanical/electrical systems and fire-rated walls;
      (3) Identification and resolution of conflicts between mechanical/electrical systems and Suspended ceilings and light fixtures;
      (4) Identification and resolution of conflicts between mechanical/electrical systems and Insulation;
      (5) Security system elements;
      (6) The relationship of components that are shown on separate Shop Drawings or Submittals.
      (7) Seismic restraints where required on systems.
      (8) All Work above ceilings performed by separate entities that must interface or for which space provided is limited; and
(9) Others as necessary.

2) The actual physical relationships of the various elements and systems and their interfacing with other elements and systems. The Drawings use graphic symbols to show certain physical relationships. Establishing and coordinating the actual physical relationships is the responsibility of the Contractor. Layout and arrange all elements to contribute to safety and efficiency while maintaining the intent of the design. Before work proceeds in areas of potential conflict for installing different components of the work, Contractor shall prepare Coordination drawings for review and acceptance by the Owner, that clearly demonstrate resolution of any conflicts.

3) Dimensions and elevations where conflicts may exist. Final Coordination drawings shall show resolution of any potential field conflicts.

4) The location, for maintenance and repair purposes, of all above-ceiling valves, fire dampers, control devices, meters and gauges, and heating coils, and the access hatches (in "hard lid) ceilings that provide a means of access to these devices. These devices and appurtenances must be located such that a workman has unimpeded access to perform maintenance, repair or replacement. "Unimpeded access" means that a workman can access the device from a location immediately below the device, via the removal of a lay-in ceiling tile, or an access door/panel. All above-ceiling valves, fire dampers, control devices and heating coils shall be located such that there are no interferences from systems furniture, or above-ceiling mechanical or electrical systems. The Coordination drawings must clearly represent this accessibility.

5) How equipment, controls, valves, power panels and disconnects will fit in equipment room(s) space, and still comply with code, and manufacturer’s maintenance requirements, with respect to clearance.

6) The maintenance of fire-rating of so-designated walls. Contractor shall review the architectural drawings for the location of fire-rated walls, and ensure that the placement of ducts, pipes or other systems do not compromise the fire-rating of walls. If ducts do penetrate fire-rated walls, the coordination drawings must show such penetrations, and shall indicate the placement of required Fire-smoke dampers. If the fire rating of designated walls cannot be maintained due to pipe or duct penetrations, as part of the Coordination Drawing process, the Contractor shall immediately bring these situations to the attention of the Owner.

3. Coordination of schedules and sub-contractors - The Contractor shall:
   a. Meet at project site with installer and representatives of manufacturers and fabricators who are involved in or affected by unit of work prior to installation of each major unit of work which requires coordination and interfacing with other work. Review progress of other work and preparations for particular work under consideration.
   b. Coordinate matching finish, texture, color, etc. for the new work on existing components in the project, if applicable.
   c. Coordinate work of like materials by submitting pilot samples to the Owner for review of acceptable ranges of finish textures and color variation.
   d. Coordinate completion and clean up Work of various trades in preparation for the Substantial Completion and for occupancy of the Building.
   e. Coordinate schedules, submittals, and work of the various trades to ensure efficient and orderly sequence of installation of construction, with provisions for accommodating items to be installed later. Coordinate the work among the Specifications and Drawings. Work shown on any drawing or specification is required by the Contract irrespective of the trade subdivision. Contractor shall require each trade subcontractor to review all other subdivisions of the documents for related work and shall coordinate the subcontracts accordingly.
f. Require all parties involved in the performance of the Work to cooperate in the overall coordination of the work under the direction of the Contractor. Each party, when requested to do so, shall furnish information concerning its portion of the work, and shall respond promptly and reasonably to the decisions and requests of persons designated with coordination, supervisory, administrative, or similar authority.

g. Coordinate the tolerances of all materials to ensure a proper fit in achieving the requirements of the Contract Documents.

E. STRUCTURAL, MECHANICAL AND ELECTRICAL COORDINATION
1. Contractor shall coordinate steel shop drawings to include any and all penetrations of framing members resulting from the coordination of the work of the mechanical and electrical subcontractors.
2. If penetrations in steel framing members are required, Steel shop drawings shall be reviewed and approved by the mechanical, electrical, and plumbing subcontractors prior to submission to Owner for review and subsequent fabrication by the Contractor.

F. CONTRACTOR RESPONSIBILITIES
1. Oversee preparation of Coordination Drawings, if required by this Section.
2. Assign space priorities
3. Notify Owner in writing of unresolved conflicts or interferences found during preparation of Coordination Drawings.
4. Coordination Meetings: Conduct general project coordination meetings with Subcontractors at least weekly at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Request representation at each meeting by every party currently involved in coordination or planning for the work of the entire project. Keep the Owner informed about coordination meetings. Conduct meetings in a manner which will resolve coordination problems. Record results and minutes of each meeting and distribute copies to everyone in attendance and to the Owner. Owner may attend weekly jobsite meetings with subcontractors.

G. NON-CONFORMING WORK
1. Work not installed within designated coordination areas in compliance with the Owner accepted Coordination Drawings will be considered non-conforming Work subject to removal and replacement at no additional cost to Owner.

H. SUBMITTAL REQUIREMENTS
1. If Coordination Drawings are required by this Section, submit one (1) reproducible and four (4) copies of each Coordination Drawing.
2. Submit combined, comprehensive mechanical and electrical systems Coordination Drawings.
3. Comply with requirements of Section 013000 - Administrative Requirements.
4. Signatures required on each sheet of Coordination Drawings:
   a. Coordination Drawing(s) must be signed and dated by Contractor and individual Subcontractors.
   b. By act of signature and submittal of the single combined Coordination Drawing(s), Contractor and each Subcontractor acknowledge that Work for which Contractor or said Subcontractor is responsible has been coordinated with the Work of Contractor and all other Subcontractors.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 013400
CONSTRUCTION MANAGER REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Administrative requirements for requests for information.

1.2 RELATED REQUIREMENTS
A. Section 013400.01 - Request for Information (RFI) Form: Cover form to be used when submitting a request for information.

1.3 DEFINITIONS
A. Requests for Information:
   1. A document (RFI) submitted by the Construction Manager requesting clarification of a portion of the Contract Documents.
   2. A properly prepared request for information shall include a detailed written statement that indicates the specific drawing or specification in need of clarification and the nature of the clarification requested.
      a. Drawings shall be identified by drawing number and location on the drawing sheet.
      b. Specifications shall be identified by Section number, page and paragraph.

B. Improper RFI:
   1. An RFI that is not properly prepared.
   2. An improper RFI will be processed by the Architect at the Architect's standard hourly rate and the Architect will charge the Owner; such costs will be deducted from monies still due the Construction Manager. The Construction Manager will be notified by the Architect prior to the processing of an improper RFI.

C. Frivolous RFI:
   1. An RFI that requests information that is clearly indicated in the Contract Documents.
   2. A frivolous RFI may be returned unanswered or may be processed by the Architect at the Architect's standard hourly rate and the Architect will charge the Owner; such costs will be deducted from monies still due the Construction Manager. The Construction Manager will be notified by the Architect prior to the processing of a frivolous RFI.

1.4 CONSTRUCTION MANAGER'S REQUESTS FOR INFORMATION
A. When the Construction Manager is unable to determine from the Contract Documents, the material, process or system to be installed, the Architect will be requested to make a clarification of the indeterminate item.
   1. Whenever possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, the Construction Manager shall prepare and submit an RFI to the Architect.

B. The Construction Manager shall endeavor to keep the RFI quantity to a minimum. In the event the process becomes unwieldy, in the opinion of the Architect, because of the quantity and frequency of requests, the Architect may require the Construction Manager to abandon the process and submit future requests as either submittals, substitutions, or requests for change.

C. An RFI shall be submitted using the form in Section 013400.01 - Request for Information (RFI) Form as the cover for the submittal, provide additional documentation as required. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or scanning. Each page of attachments shall bear the RFI number in the lower right corner.

D. An RFI shall be originated through the Construction Manager.
   1. An RFI from a subcontractor or material supplier shall be submitted to, reviewed by and signed by the Construction Manager prior to submittal to the Architect.
2. An RFI sent directly to the Architect or the Architect's consultants, by a subcontractor, will not be accepted and will be returned unanswered.

E. The Construction Manager shall carefully study the Contract Documents to assure that the requested information is not available there. An RFI that requests information available in the Contract Documents will be deemed "improper" or "frivolous".

F. In cases where an RFI is issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically and similar items, the Construction Manager shall offer assistance or suggest solutions using drawings or sketches drawn to scale, and submitted with the RFI. An RFI which fails to include a suggested solution will be returned unanswered with a requirement that the Construction Manager submit a complete request.

G. An RFI shall not be used for the following purposes:
   1. To request approval of submittals.
   2. To request approval of substitutions.
   3. To request changes that entail additional cost or credit.
   4. To request different methods of performing work than those drawn or specified.

H. In the event the Construction Manager believes that a clarification by the Architect results in additional cost or time, the Construction Manager shall not proceed with the work indicated by the RFI until a change order is prepared and approved. An RFI shall not automatically justify a cost increase in the work or a change in the project schedule.
   1. An answered RFI shall not be construed as approval to perform extra work.

I. The Construction Manager will prepare and maintain an RFI log, and furnish copies of the log to all parties indicating the status of all RFIs.

J. The Construction Manager shall allow up to 14 days for review. However, the Architect and the consultants will endeavor to respond in a timely fashion to an RFI.

1.5 ARCHITECT'S RESPONSE TO REQUESTS FOR INFORMATION

A. The Architect will respond to an RFI on one of the following forms:
   1. Properly prepared RFI:
      a. Architect's Supplemental Instructions.
      b. Section 013400.01 - REQUEST FOR INTERPRETATION (RFI) FORM.
      c. Work Changes Proposal Request.

B. Improper or frivolous RFI:
   1. Notification of processing fee.
   2. An unanswered RFI will be returned with a stamp or notation: Not Reviewed.

C. The Architect may opt to retain an RFI for discussion during regularly scheduled project meetings, for inclusion of responses in meeting minutes in lieu of responding on a written form.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION
REQUEST FOR INFORMATION (RFI) FORM

SECTION 013400.01

DATE SUBMITTED: ____________ ARCHITECT'S ASSIGNED RFI # ____________

TO THE ARCHITECT:

E4H ENVIRONMENTS FOR HEALTH ARCHITECTURE
23 Drydock Ave., Suite 23-610W
Boston, MA  02210
Contact: Luke Thiboutot, Senior Associate
Phone: 617.772.0260
Email: lthiboutot@e4harchitecture.com

E4H PROJECT NUMBER: 2017069

SUBMITTED BY:

COMPANY: _______________________________________
ADDRESS: _______________________________________

REFERENCES:

Specification Section Number:_____________________
Article / Paragraph / Subparagraph: _________________
Drawing Number:______________
Detail Number:________________

REQUEST: (Refer to attachments if applicable)

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

SIGNED BY:__________________________________________
SECTION 013561
INTERIM LIFE SAFETY MEASURES

PART 1 - GENERAL
1.1 SUMMARY
   A. Interim Life Safety Measures (ILSM).

1.2 PERFORMANCE REQUIREMENTS
   A. Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in the Conditions of the Contract (General and Supplementary Conditions) and other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omissions from this section will be recognized as an indication by the Architect that such temporary activity is not required for successful completion of the work and compliance with requirements of Contract Documents.
   B. Implementation of the Interim Life Safety Measures (ILSM) shall be required in or adjacent to all construction areas. ILSM apply to all personnel. Implementation of ILSM shall begin upon project commencement, and be continuous through project completion.
   C. The ILSM are intended to provide a level of life safety comparable to that described in chapters 1-7, 31 and the applicable occupancy chapters of latest adopted edition of the Life Safety Code (NFPA 101).

1.3 SUBMITTALS
   A. See Section 013000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. The Construction Manager shall submit completed copies of the daily checklist included at the end of this section to the Owner's Representative with copies of weekly progress reports.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION
3.1 INTERIM SAFETY MEASURES
   A. All exits and exit corridors shall remain clear and unobstructed at all times.
   B. When exiting paths need to be changed or modified in any way, the modifications shall be performed only with the prior written approval of the Owner's Representative.
   C. When a specific construction task must be performed in an exit corridor, at no time may the clear width be reduced to less than 1/2 corridor width or 48” (whichever is greater). Cones and barricades shall be used to identify the construction.
   D. When normal access and egress routes are affected by construction, safe alternate routes shall be developed and approved by Plant Operations and the Owner's Representative.
   E. Temporary access and egress routes shall be identified with professionally painted signs. Signs shall also restrict access to the construction area.
   F. Temporary lighted exit signs shall be provided where lighted exit sign would be required by Code.
   G. All combustible debris shall be removed from the work site at the end of each work shift.
   H. All work areas shall be separated from the rest of the building with barriers of noncombustible materials. All barriers shall have clean smooth surfaces.
      1. Barriers shall be existing construction or temporary dust proof partitions as defined in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
   I. All penetrations of fire and smoke walls, and floor slabs shall be properly sealed at the end of each work shift.
J. Provide adequate support for all ceiling mounted equipment, fixtures, devices, etc. which will remain in area where ceiling grid is being removed.

K. All ceiling tiles in occupied areas shall be replaced at the end of each work shift.

L. Obtain advance written approval from Owner's Representative prior to use of flammable liquids.

M. Limit the supply of flammable liquids and compressed gas cylinders on the job site to one-day supply. Additional flammable liquids and compressed gas cylinders shall not be stored inside the building.
   1. Compressed gas cylinders shall be chained to a wall or stored in an approved cart.

N. Obtain appropriate permits from the Owner's Representative prior to starting welding, cutting, and the use of flame.

O. Appropriate types of portable fire extinguishers shall be present and accessible at all times in each work area at a designated location such as the plan table. An additional fire extinguisher shall be provided at each location of welding and cutting with an open flame.
   1. As appropriate to the hazard potential associated with the job, contractor's personnel who work in the area shall be provided with training in the use of portable fire extinguishing equipment.

P. Until completion of the construction project, all combustible storage in the area of the job site shall be kept at the minimum acceptable level for building operations.

Q. Prior to any modification of the fire alarm system, the following people shall be notified. All modifications to the fire alarm system can only be scheduled with the approval of:
   1. The Owner's Representative
   2. Director of Plant Operations
   3. Local Fire Department

R. A temporary, but equivalent system shall be provided when any fire system is impaired. Temporary systems shall be inspected and tested, or a fire watch will be provided.

S. In renovation and refurbishment areas where dust producing operations would produce false alarms, following written approval from the Owner's Representative, cover prior to starting work, then uncover the smoke detectors at the end of each day's work.

T. The Construction Manager shall strictly enforce a no smoking policy at all work sites. All construction personnel and employees of the contractors shall strictly observe the Owner's smoking policy. Smoking shall be prohibited in or adjacent to the Owner's property by all personnel.

3.2 SCHEDULES

A. A sample "INTERIM LIFE SAFETY DAILY CHECKLIST" to be used is attached at the end of this section.
SECTION 013561.01
INTERIM LIFE SAFETY - DAILY CHECKLIST

PROJECT: ____________________________________________________________
LOCATION: __________________________________________________________
DATE: ______________________________________________________________

CHECKLIST ITEMS: YES / NO
A. All exits and corridors clear and unobstructed.
B. Are normal access routes affected by construction?
C. Alternate routes designated and approved by the Owner’s Representative.
D. All combustible debris removed at end of work shift.
E. Work areas separated from the rest of the building with barriers.
F. All penetrations of firewalls and smoke walls sealed at end of shift.
G. Ceiling tiles replaced at end of shift.
H. Advance written approval obtained from the Owner’s Representative for usage of flammable liquids.
I. Compressed gas cylinder secured/stored correctly.
J. Appropriate permit for use of open flame.
K. Portable fire extinguishers are present.
L. Fire drill performed.
M. Notification made to appropriate personnel prior to fire alarm modifications.

INSPECTION FORM COMPLETED BY: ______________________________________
CONTRACTOR: _______________________________________________________
LOCATION: __________________________________________________________
COMMENTS: __________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

END OF SECTION
SECTION 013562
INFECTION CONTROL POLICIES

PART 1 - GENERAL

1.1 SUMMARY

A. Infection control policies.

1.2 QUALITY ASSURANCE

A. Infection control is critical in all hospital areas. Dust in ceilings and construction debris contains fungus which, if inhaled by patients, can cause pneumonia and even death. Construction activities causing disturbances of existing dust or creating new dust shall be conducted in tight enclosures cutting off any flow of particles into patient areas.

B. It is the policy of the Owner to contain airborne contaminates related to construction, such as dust, airborne fungus, vapors and odors, and to identify precautions necessary to do so. Waterborne contaminates are also of concern when pipes are shut off for long periods of time, and precautions shall be taken to prevent the creation of reservoirs where pathogens can grow.

1.3 EDUCATION

A. Dust and dirt carry microorganisms that can be spread by clothing and shoe contamination.

B. Intrinsic risks are involved during renovation/construction in a hospital environment.

C. Prevention and control:
   1. The Owner will educate contractors and construction workers; each person must understand the reasons for and the need for compliance with infection control policies for the control of airborne pathogens, as well as dust and dirt.

1.4 PROJECT CONDITIONS

A. Infection control policies will be reviewed before beginning construction/renovation and decisions will be made for the implementation of prevention and control measures that will be monitored and documented throughout the duration of the project.
   1. These requirements shall be included in the Construction Manager’s Contracts.
   2. Reports will be presented to the Owner’s Infection Control Committee.

1.5 SUBMITTALS

A. See Section 013000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Pre and post construction checklists.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Pre and post construction checklists to be completed for this construction / renovation project.

3.2 SCHEDULES

A. A sample "INFECTION CONTROL POLICY CHECKLIST" to be used is included after this section.

END OF SECTION
### SECTION 013562.01
### INFECTION CONTROL CHECKLIST

<table>
<thead>
<tr>
<th>CONSTRUCTION/RENOVATION POLICY CHECKLIST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1 AIR HANDLING</strong></td>
</tr>
<tr>
<td><strong>TYPE OF HVAC SYSTEM INVOLVED IDENTIFIED.</strong></td>
</tr>
<tr>
<td><strong>IDENTIFIED WHAT PORTIONS WILL BE SHUT DOWN.</strong></td>
</tr>
<tr>
<td><strong>IDENTIFIED AIR SOURCES.</strong></td>
</tr>
<tr>
<td><strong>IDENTIFIED AIR FILTERS THAT WILL BE SHUT DOWN AND THOSE THAT WILL HAVE INCREASED LOAD.</strong></td>
</tr>
<tr>
<td><strong>REMOVED FILTERS IN SHUTDOWN AREAS.</strong></td>
</tr>
<tr>
<td><strong>CHANGED FILTERS IN INCREASED FLOW AREAS.</strong></td>
</tr>
<tr>
<td><strong>INSTALLED HEPA FILTERS IN AREAS THAT CARE FOR COMPROMISED PATIENTS.</strong></td>
</tr>
<tr>
<td><strong>AREAS ABOVE CEILING TILES CLEANED WITH HEPA FILTERED VACUUM BEFORE OPENING.</strong></td>
</tr>
<tr>
<td><strong>ALL AIR DUCTS, VENTILATION DUCTS, DOORS, SERVICE CHUTES SEALED AND TAPED CLOSED.</strong></td>
</tr>
<tr>
<td><strong>AFTER SEALING OF AREA COMPLETE AND NEGATIVE PRESSURE FAN IS ON, BUT DEMOLITION HAS NOT STARTED, THE REMAINING SYSTEM IS TESTED FOR ABILITY TO MAINTAIN NEGATIVE PRESSURE AND POSITIVE PRESSURE IN THOSE AREAS THAT REQUIRE IT.</strong></td>
</tr>
<tr>
<td><strong>JUST PRIOR TO DEMOLITION, ALL AIR DUCTS ARE SEALED.</strong></td>
</tr>
<tr>
<td><strong>NEGATIVE AIR PRESSURE HEPA FILTER WITH ALARM INSTALLED IN PROJECT AREA AT ALL TIMES.</strong></td>
</tr>
<tr>
<td><strong>THOSE INTAKES THAT ARE WITHIN 25’ OF CHUTE OR EXPOSED TO UNFILTERED EXHAUST AIR ARE SEALED AND TAPED DURING THE CONSTRUCTION/RENOVATION PROJECT.</strong></td>
</tr>
<tr>
<td><strong>ALL WINDOWS ARE SEALED CLOSED FOR THE DURATION OF THE DEMOLITION.</strong></td>
</tr>
<tr>
<td><strong>NOTIFICATION IS SENT TO ALL UNITS INVOLVED OF EXPECTED DATES OF ALTERED INTERRUPTION IN NORMAL AIR HANDLING SYSTEM.</strong></td>
</tr>
</tbody>
</table>

<p>| <strong>1.2 BARRIERS</strong> | YES | NO | DATE | N/A |
| <strong>RESTRICTED AREA SIGNS ARE POSTED.</strong> | | | | |
| <strong>ACCESS PATH AND ELEVATOR TO WORK SITE DESIGNATED FOR CONSTRUCTION WORKERS.</strong> | | | | |
| <strong>APPROPRIATE CEILING TO FLOOR BARRIERS ERECTED AND SEALED.</strong> | | | | |
| <strong>ACCESS DOOR IS GASKETED AND HAS TIGHT SEAL.</strong> | | | | |</p>
<table>
<thead>
<tr>
<th>INFECTION CONTROL CHECKLIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADHESIVE STRIPS PLACED OUTSIDE CONSTRUCTION SITE DOOR.</td>
</tr>
<tr>
<td>APPROPRIATE ATTIRE AVAILABLE FOR THOSE WHO REQUIRE IT UPON ENTERING OR EXITING PROJECT AREA.</td>
</tr>
<tr>
<td>1.3 PROJECT AREA</td>
</tr>
<tr>
<td>COVERED BINS AVAILABLE FOR MOVING TOOLS, EQUIPMENT AND DEBRIS TO AND FROM SITE.</td>
</tr>
<tr>
<td>HEPA FILTERED VACUUMS AVAILABLE FOR ROUTINE CLEANING OF SITE.</td>
</tr>
<tr>
<td>SEAL ALL (EXCEPT CHUTE) WINDOWS CLOSED.</td>
</tr>
<tr>
<td>1.4 TRAFFIC CONTROL</td>
</tr>
<tr>
<td>PATH TO AND FROM SITE AWAY FROM PATIENTS, VISITORS; ASSIGNED TO CONSTRUCTION WORKERS.</td>
</tr>
<tr>
<td>ELEVATOR ASSIGNED TO CONSTRUCTION WORKERS.</td>
</tr>
<tr>
<td>NEW ROUTES TO AREAS FOR EMPLOYEES OF HOSPITAL IDENTIFIED AND PLAN COMMUNICATED TO ALL DEPARTMENTS.</td>
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<tr>
<th>CONSTRUCTION/RENOVATION POLICY CHECKLIST</th>
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<tbody>
<tr>
<td>2.1 AIR HANDLING</td>
</tr>
<tr>
<td>ALL FILTERS WILL BE CHECKED FOR DEBRIS/LEAKAGE.</td>
</tr>
<tr>
<td>NEW FILTERS INSTALLED.</td>
</tr>
<tr>
<td>ALL AIR DUCTS, VENTILATION DUCTS, DOORS, SERVICE CHUTES UNSEALED.</td>
</tr>
<tr>
<td>ALL AIR INTAKES UNSEALED.</td>
</tr>
<tr>
<td>ENSURE HVAC SYSTEMS ARE BALANCED TO SPECIFICATIONS.</td>
</tr>
<tr>
<td>DETERMINE THAT NEGATIVE AND POSITIVE PRESSURE AREAS ARE FUNCTIONING CORRECTLY.</td>
</tr>
<tr>
<td>2.2 BARRIERS</td>
</tr>
<tr>
<td>BARRIER AND IMMEDIATE AREA WASHED DOWN BEFORE DISMANTLING.</td>
</tr>
<tr>
<td>AREA WASHED DOWN AFTER DISMANTLING.</td>
</tr>
<tr>
<td>2.3 PROJECT AREA</td>
</tr>
<tr>
<td>PROJECT AREA CLEAN AND EMPTY OF TOOLS AND EQUIPMENT (BEFORE BARRIERS REMOVED).</td>
</tr>
<tr>
<td>HOUSEKEEPING THOROUGHLY CLEANS AREA.</td>
</tr>
<tr>
<td>AREA CHECKED ONE WEEK LATER FOR EVALUATION OF NEED TO RE-CLEAN.</td>
</tr>
<tr>
<td>INSPECTED FOR WATER PRESSURE.</td>
</tr>
<tr>
<td>INSPECTED FOR ABSENCE OF AERATORS ON FAUCETS.</td>
</tr>
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<td>-----------------------------------------------</td>
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END OF SECTION
SECTION 014000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Related requirements.
   2. Site safety, worker safety and training.
   3. Reference standards.
   4. Quality assurance submittals.
   5. Testing and inspection agencies.
   6. Control of installation.
   7. Mock-ups.
   8. Tolerances.
  10. Manufacturers’ field services.
  11. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.
B. Section 014200 - References
C. Section 016000 - Product Requirements: Requirements for material and product quality.

1.3 REFERENCE STANDARDS

G. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
H. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
I. Obtain copies of standards where required by product specification sections.
J. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
L. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.
1.4 SITE SAFETY, WORKER SAFETY AND TRAINING

A. General: The Construction Manager shall, at all times, exercise reasonable precautions for the safety of all persons. All rules, regulations, and laws concerning safety that are in effect at the work site, and in particular, all applicable regulations of the Occupational Safety and Health Administration (OSHA) of the U.S. Government, in addition to specified requirements shall be complied with in all respects.

1. Construction Manager’s responsibility for safety shall apply continuously twenty four (24) hours per Day during the term of this Contract and is not limited to normal working hours.

B. Construction Manager’s Safety Program: Prior to commencement of the Work, the Contractor shall develop and implement a Safety and Health Plan to comply with the Occupational Safety and Health Administration (OSHA) standards for the Construction Industry and all other applicable Federal, State, local laws and regulations. Construction Manager’s Safety and Health Plan, and included health and safety procedures and policies, shall be submitted to the Architect and Owner’s Representative within fifteen (15) Days after the date of Notice to Proceed and in no event later than commencement of the Work, whichever occurs first.

1. Perform pre planning to ensure access is provided to Fire Department for all areas of the work site throughout the duration of the Contract. The Construction Manager shall provide the Fire Department site access maps, updated regularly, to reflect changes in the layout of the work site and shall notify the Fire Department when each update is made.

2. Post and maintain, at prominent locations throughout the Project site, emergency telephone numbers and shall insure that all personnel on site are continuously aware of this information.

3. Ensure safe access to the Work for the Owner, Architect, Architect's consultants, their designated representatives; all others charged with inspection, testing and monitoring of the Work; and visitors to the site. The Construction Manager shall furnish site visitors with safety equipment, safety apparel and instructions that are required to insure their safety on site and In the performance of their duties related to the Work of this Contract.

C. To the extent mandated by code or other regulation, and in compliance with labor agreements, employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration. The OSHA training and certification course shall occur at the time each employee begins work. To the extent required, furnish documentation to Owner and Architect, for each employee requiring training documenting successful completion of the OSHA safety training and certification course.

1.5 QUALITY ASSURANCE SUBMITTALS

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit copies of report to Architect and to Construction Manager.

1. Include:
   a. Date issued.
   b. Project title and number.
   c. Name of inspector.
   d. Date and time of sampling or inspection.
QUALITY REQUIREMENTS

1. Identification of product and specifications section.
   f. Location in the Project.
   g. Type of test/inspection.
   h. Date of test/inspection.
   i. Results of test/inspection.
   j. Conformance with Contract Documents.
   k. When requested by Architect, provide interpretation of results.
   l. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Construction Manager or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator, or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.6 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing.

B. Owner Employed Agency:
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in the State in which the Project is located.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

C. Employment of agency in no way relieves any contractor of the obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL
   A. The Owner reserves the right to take samples and perform, at random, tests of approved materials delivered to the job site to verify compliance of actual materials with specifications.
3.2 CONTROL OF INSTALLATION
A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
B. Comply with manufacturers’ instructions, including each step in sequence.
C. Should manufacturers’ instructions conflict with Contract Documents, request clarification from Architect before proceeding.
D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. Have work performed by persons qualified to produce required and specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.3 MOCK-UPS
A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
C. Accepted mock-ups shall be a comparison standard for the remaining Work.
D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, contractors shall remove mock-up and clear area when directed to do so by Architect.

3.4 TOLERANCES
A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
B. Comply with manufacturers’ tolerances. Should manufacturers’ tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

3.5 TESTING AND INSPECTION
A. See individual specification sections for testing and inspection required.
B. Testing Agency Duties:
   1. Test samples of mixes submitted by Construction Manager.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Construction Manager of observed irregularities or non-compliance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.
   8. Submit reports of all tests/inspections specified.
C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Construction Manager.
4. Agency has no authority to stop the Work.

D. Construction Manager Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Construction Manager beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Construction Manager.

3.6 MANUFACTURERS' FIELD SERVICES
A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.7 DEFECT ASSESSMENT
A. Replace Work or portions of the Work not complying with specified requirements.
B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Owner will direct an appropriate remedy or adjust payment.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. Abbreviations and Acronyms.
   B. Definitions.
   C. Reference Standards.

1.2 ABBREVIATIONS AND ACRONYMS
   A. The following list of common abbreviations are referenced in individual specification sections.
      This list is provided for convenience to the Contractor and is not intended to define all
      abbreviations use in the Contract Documents.
      1. Abbreviations for contract and specifications.
         EPA United States Environmental Protection Agency
         HHS US Department of Health and Human Services
         HVAC&R Heating, ventilating, air conditioning, and refrigeration systems
         IAQ Indoor Air Quality
         IEQ Indoor Environmental Quality
         MSDS Material Safety Data Sheet
         NIC Not in Contract
         OFCI Owner Furnished, Contractor Installed
         OFI or OFOI Owner Furnished and Installed
         TJC The Joint Commission (formerly JCAHO - Joint Commission on Accreditation of Healthcare Organizations)
         VOC Volatile Organic Compounds
      2. Abbreviations for measurements and quantities:
         C Celsius
         cm Centimeter
         F Fahrenheit
         Hrs Hours
         Kg Kilogram
         L Liter
         M meter
         m2 or SM square meter
         m3 or CM cubic meter
         mm Millimeter
         Mths Months
         psi Pounds per square inch
         t ton

1.3 DEFINITIONS
   A. Definitions of contracting parties (Owner, Owner’s Project Manager, General, and Architect):
      Refer to Section 011000 - PROJECT SUMMARY.
   B. Definitions for terms utilized in the Contract Documents:
      1. "As necessary," "as directed," "when directed," "satisfactory," "good and sufficient," "approved," or other general qualifying terms are used on the Drawings: These terms are deemed to be followed by the words, "in the opinion of the Architect," or "by the Architect," as the case may be.
      2. "Addenda": written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including the Drawings and Specifications, by additions, deletions, clarifications or corrections.
3. “Approval,” "approved, “approved equal,” "or equal," or "other approved" means as approved by the Architect.”

4. The terms “Contractor”, “General Contractor”, and “Contractor” as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. These terms refer to the same entity.

5. The term “Day”: is defined as the following:
   a. The term “calendar day” is a full 24 hour period, starting from 12 AM (midnight), and includes all weekends and legal holidays.
   b. The term “working day” shall mean any calendar day except Saturdays, Sundays, and legal holidays at the place of the building.
   c. Where the term “day” is used without the adjective of “calendar” or “working”, it shall mean “calendar day”.

6. Furnish and Install” or “Provide”: items identified shall be furnished and installed under this Contract. The term “Furnish”, when used separately, shall mean that the items referred to shall be furnished, only. Similarly the term “install”, when used separately, shall mean that the items referred to shall be installed, only.

7. “Knowledge,” “recognize” and “discover,” their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill and diligence required by the Contract Documents. Analogously, the expression “reasonably inferable” and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor familiar with the Project and exercising the care, skill and diligence required of the Contractor by the Contract Documents.

8. “Not in Contract” or “N.I.C.”: equipment, furnishings, or other materials not included as a part of this Contract.


1.4 REFERENCE STANDARDS

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by DATE OF ISSUE for Contract Documents, current on date of Owner-Contractor Agreement.


D. The contractual relationship to the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. Schedule of References:
   1. Listed below are abbreviations for the names and titles of trade association names, federal government agencies and similar organizations which are referenced in the individual specification sections. The addresses and phone numbers provided are for the Contractor’s convenience and are believed to be current and accurate, however addresses and phone numbers frequently change, and no assurance is made on their accuracy:

<table>
<thead>
<tr>
<th>abbreviation</th>
<th>name</th>
<th>address</th>
<th>phone numbers</th>
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<tbody>
<tr>
<td>AA</td>
<td>Aluminum Association</td>
<td>900 19th Street N.W., Suite 300 Washington, DC 20006</td>
<td><a href="http://www.aluminum.com">www.aluminum.com</a></td>
</tr>
<tr>
<td>AAMA</td>
<td>American Architectural Manufacturer’s Association</td>
<td>1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268</td>
<td><a href="http://www.aamanet.org">www.aamanet.org</a></td>
</tr>
</tbody>
</table>
REFERENCES

ACI  American Concrete Institute, International
    38800 Country Club Drive, Farmington Hills, Michigan 48331
    www.aci-int.org

ADC  Air Diffusion Council
    104 S. Michigan Ave, Suite 1500, Chicago, IL 60603
    www.flexibleduct.org

AFPA American Forest & Paper Association
    (Formerly NFPA National Forest Products Association)
    1111 19th St. N.W., Suite 800, Washington, DC 20036
    www.afandpa.org

AGA  American Gas Association Inc.
    1515 Wilson Blvd. Arlington, VA 22209-2469
    www.agagas.com

AGAI American Galvanizers Association Inc.
    12200 E.lliff Ave, Suite 204, Aurora, CO 80014-1252
    www.galvanizeit.org

AIA  American Institute of Architects
    1735 New York Avenue, N.W., Washington, DC 20006-5292
    www.aia.org

AIHA American Industrial Hygiene Association
    2700 Prosperity Ave, Suite 250, Fairfax VA 22031
    www.aiha.org

AISC American Institute of Steel Construction
    1 E. Wacher Dr., Suite 3100, Chicago, IL 60601-2001
    www.aisc.org

AMCA Air Movement and Control Association
    30 W. University Drive, Arlington Heights, IL 60004-1893
    www.amca.org

ANSI American National Standards Institute
    11 W. 42nd Street, 13 Floor, New York, NY 10036
    wwwansi.org

APA The Engineered Wood Association
    (formerly APA - American Plywood Association)
    P.O. Box 11700, Tacoma, WA 98411-0070
    www.apawood.org

ARI Air-Conditioning and Refrigeration Institute
    4301 N. Fairfax Dr., Suite 425, Arlington, VA 22203
    www.ari.org
<table>
<thead>
<tr>
<th>Organization</th>
<th>Address</th>
<th>Website</th>
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<tbody>
<tr>
<td>ASCA</td>
<td>Architectural Spray Coaters Association</td>
<td><a href="http://www.aecinfo.com">www.aecinfo.com</a></td>
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<tr>
<td></td>
<td>230 West Wells Street, Suite 311, Milwaukee</td>
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<td>and Air-Conditioning Engineers</td>
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<tr>
<td></td>
<td>1791 Tullie Circle NE, Atlanta GA 30329</td>
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<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
<td><a href="http://www.asme.org">www.asme.org</a></td>
</tr>
<tr>
<td></td>
<td>345 East 47th Street, New York, NY 10017-2392</td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
<td><a href="http://www.astm.org">www.astm.org</a></td>
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<tr>
<td></td>
<td>100 Barr Harbor Drive, West Conshohocken,</td>
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<td>PA 19428</td>
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<tr>
<td>AWI</td>
<td>Architectural Woodwork Institute</td>
<td><a href="http://www.awinet.org">www.awinet.org</a></td>
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<tr>
<td></td>
<td>1952 Isaac Newton Square W., Reston, VA 20190</td>
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<tr>
<td>AWPA</td>
<td>American Wood Preservers’ Association</td>
<td><a href="http://www.awpa.com">www.awpa.com</a></td>
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<tr>
<td></td>
<td>P.O. Box 286, Woodstock, MD 21163-0286</td>
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<td>AWPI</td>
<td>American Wood Preservers’ Institution</td>
<td><a href="http://www.oas.org">www.oas.org</a></td>
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<td>1945 Old Gallows Rd., Suite 150, Vienna, VA</td>
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<td>AWS</td>
<td>American Welding Society</td>
<td><a href="http://www.aws.org">www.aws.org</a></td>
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<td></td>
<td>550 LeJeune Road, N.W., Miami, FL 33126</td>
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<tr>
<td>BHMA</td>
<td>Builders Hardware Manufacturers Association,</td>
<td><a href="http://www.buildershardware.com">www.buildershardware.com</a></td>
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<tr>
<td></td>
<td>Inc.</td>
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<td></td>
<td>355 Lexington Ave., 17 Floor New York, NY 10017</td>
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<tr>
<td>CISCA</td>
<td>Ceilings &amp; Interior Systems Construction</td>
<td><a href="http://www.cisca.org">www.cisca.org</a></td>
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<td></td>
<td>Association</td>
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<td></td>
<td>579 W. North Ave., Suite 301, Elmhurst, IL</td>
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<td>CRI</td>
<td>Carpet and Rug Institute</td>
<td><a href="http://www.carpet-rug.com">www.carpet-rug.com</a></td>
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<td></td>
<td>310 Holiday Ave., Dalton, GA 30720</td>
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<tr>
<td>CRSI</td>
<td>Concrete Reinforcing Steel Institute</td>
<td><a href="http://www.crsi.org">www.crsi.org</a></td>
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<td>933 N. Plum Grove Road, Schaumburg, IL 60173-</td>
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<tr>
<td>CTIOA</td>
<td>Ceramic Tile Institute of America</td>
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<td></td>
<td>12061 W. Jefferson BLVD, Culver City, CA 90230-6219</td>
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<td><a href="http://www.ctioa.org">www.ctioa.org</a></td>
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<td>DHI</td>
<td>Door and Hardware Institute</td>
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<td>14170 Newbrook Dr., Chantilly, VA 22021-2223</td>
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<td><a href="http://www.dhi.org">www.dhi.org</a></td>
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<td>FM</td>
<td>Factory Mutual Engineering &amp; Research Corp.</td>
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<td>1151 Boston-Providence Turnpike, Norwood, MA 02062</td>
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<td><a href="http://www.fmglobal.com">www.fmglobal.com</a></td>
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<td>GA</td>
<td>Gypsum Association</td>
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<td></td>
<td>6525 Belcrest Road, Suite 480, Hyattsville, MD 20782</td>
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<td><a href="http://www.gypsum.org">www.gypsum.org</a></td>
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<td>GANA</td>
<td>Glass Association of North America</td>
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<td></td>
<td>800 SW Jackson Street #1500, Topeka, KS 66612</td>
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<td><a href="http://www.glasswebsite.com">www.glasswebsite.com</a></td>
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<td>GICC</td>
<td>Glazing Industry Code Committee</td>
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<td>3310 Harrison St., Topeka, KS 66611-2279</td>
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<td><a href="http://www.glazingcodes.net">www.glazingcodes.net</a></td>
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<td>IGCC</td>
<td>Insulating Glass Certification Council</td>
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<td>PO Box 730, Sackets Harbor, NY 13685</td>
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<td><a href="http://www.igcc.org">www.igcc.org</a></td>
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<td>IGMA</td>
<td>Insulating Glass Manufacturer's Alliance</td>
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<td></td>
<td>27 North Wacker Drive, Suite 365, Chicago, IL 60606</td>
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<td><a href="http://www.igmaonline.org">www.igmaonline.org</a></td>
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<td>MIL</td>
<td>Military Specifications and Standards</td>
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<td>Naval Publications and Forms Center</td>
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<td>5801 Tabor Avenue, Philadelphia, PA 19120</td>
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<td><a href="http://www.milspec.com">www.milspec.com</a></td>
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<tr>
<td>NAAMM</td>
<td>National Association of Architectural Metal Manufacturers</td>
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<td></td>
<td>8 South Michigan Avenue, Suite 1000, Chicago, IL 60603</td>
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<td><a href="http://www.naamm.org">www.naamm.org</a></td>
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<td>NEBB</td>
<td>National Environmental Balancing Bureau</td>
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<td>8575 Government Circle, Gaithersburg, MD 20877-4121</td>
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<td><a href="http://www.nebb.org">www.nebb.org</a></td>
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<td>NEMA</td>
<td>National Electrical Manufacturers' Association</td>
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<td></td>
<td>1300 N. 17th St., Suite 1846, Rosslyn, VA 22209</td>
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<td><a href="http://www.nema.org">www.nema.org</a></td>
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<td>NFPA</td>
<td>National Fire Protection Association</td>
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<td>1 Battery March Park, PO Box 9101, Quincy, MA 02269</td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES
014200 - 5
REFERENCES

NFRC
National Fenestration Rating Council
6305 Ivy Lane, Greenbelt MD 20770
www.nfpa.org

NRCA
National Roofing Contractors Association
10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607
www.nrca.net

PCA
Portland Cement Association
5420 Old Orchard Road, Skokie, IL 60077-1083
www.cement.org

PS
Product Standard
U. S. Department of Commerce
www.omg.org

SDI
Steel Deck Institute
P.O. Box 25, Fox River Grove, IL 60021-0025
www.sdi.org

SDI
Steel Door Institute
30200 Detroit Road, Cleveland, OH 44145-1967
www.steeldoors.org

SGCC
Safety Glass Certification Council
RMS, P.O. Box 9 Henderson Harbor, NY 13651
www.sgcc.org

SJI
Steel Joist Institute
3127 10th Ave. N., Myrtle Beach, SC 29577
www.steeljoist.org

SMACNA
Sheet Metal and Air Conditioning Contractors’ National Association
4201 Lafayette Center Dr., Chantilly, VA 22022-1209
www.smacnana.org

SPIB
Southern Pine Inspection Bureau
4709 Scenic Highway, Pensacola, FL 32504-9094
www.spib.org

SSMA
Steel Stud Manufacturer’s Association
8 South Michigan Avenue, Chicago IL 60603
www.ssma.com

SSPC
The Society for Protective Coatings
40 24th Street, 6th Floor, Pittsburgh PA 15222-4623
www.sspc.org
REFERENCES

SSWRI  Sealant, Waterproofing & Restoration Institute
2841 Main Street, Suite 585, Kansas City, MO 64108
www.swrionline.org

TCNA  Tile Council of North America, Inc.
100 Clemson Research Blvd., Anderson, SC 29625
www.tileusa.com
(formerly TCA, Tile Council of America)

UL  Underwriters’ Laboratories, Inc.
333 Pfingston Road, Northbrook, IL 60602
www.ul.com

WDMA  Window & Door Manufacturers Association
(formerly National Wood Window & Door Association, NWWDA)
205 E. Touhy Avenue, Suite G-54, Des Plaines, IL 60018
www.nwwda.org

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Temporary telecommunications services.
   B. Temporary sanitary facilities.
   C. Temporary Controls: Barriers and enclosures.
   D. Security requirements.
   E. Vehicular access and parking.
   F. Waste removal facilities and services.
   G. Field offices.
   H. Removal of temporary facilities and controls.

1.2 RELATED REQUIREMENTS
   A. Section 015100 - Temporary Utilities.
   B. Section 015611 - Temporary Dust, Fume, and Odor Control.
   C. Section 017000 - Execution and Closeout Requirements.

1.3 REFERENCE STANDARDS

1.4 TEMPORARY TELECOMMUNICATIONS SERVICES
   A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
   B. Telecommunications services shall include:
      1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
      2. Telephone Land Lines: One line, minimum; one handset per line.
      3. Internet Connections: Minimum of one; DSL modem or faster.

1.5 TEMPORARY SANITARY FACILITIES
   A. Required facilities will be coordinated between the Owner and Construction Manager prior to start of construction.
   B. Maintain daily in clean and sanitary condition.
   C. At end of construction, return facilities to same or better condition as originally found.

1.6 BARRIERS
   A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner’s use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
   B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.7 EXTERIOR ENCLOSURES
   A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections,
and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.8 INTERIOR ENCLOSURES
   A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
   B. Construction: Metal or wood framing, as deemed necessary, and gypsum board or plywood, as deemed necessary, with closed joints and sealed edges at intersections with existing surfaces:
      1. Minimum STC rating of 35 in accordance with ASTM E90.
      2. Maximum flame spread rating of 75 in accordance with ASTM E84.
      3. Assembly shall comply with NFPA 241.
   C. Where fire-resistant rated enclosures are required, construct barriers utilizing 1 hour fire resistance rated construction, consisting of Type "X" gypsum wallboard and studs. Thickness of wallboard and the type of studs to be used, shall be as required by any of manufacturer's or industry's tests to obtain a 1 hour fire rated wall.
   D. Construct closures, using new materials only, in accordance with the general carpentry requirements in Section 061000 - Rough Carpentry, Section 092216 - Non-Structural Metal Framing and Section 092900 - Gypsum Board.
   E. All door openings within temporary partitions shall have pressed metal frames, 1-3/4" thick solid core wood doors, door closer and lock set.
      1. Doors in temporary closures must be constructed of solid new lumber and must be positively latching.
   F. Paint surfaces exposed to view from Owner-occupied areas.

1.9 SECURITY
   A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.10 VEHICULAR ACCESS AND PARKING
   A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
   B. Coordinate access and haul routes with governing authorities and Owner.
   C. Provide and maintain access to fire hydrants, free of obstructions.
   D. Provide means of removing mud from vehicle wheels before entering streets.
   E. Designated existing on-site roads may be used for construction traffic.
   F. A limited temporary parking area may be available to accommodate construction personnel. The space available will be viewed at the Pre-Bid Conference. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL
   A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
   B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   C. Provide containers with lids. Remove trash from site periodically.
   D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
   E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
1.12 FIELD OFFICES
   A. Availability of Field Office space will be coordinated between the Owner and Construction Manager.

1.13 REMOVAL OF TEMPORARY FACILITIES AND CONTROLS
   A. Remove temporary equipment, facilities, materials, prior to Date of Substantial Completion inspection.
   B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
   C. Clean and repair damage caused by installation or use of temporary work.
   D. Restore existing facilities used during construction to original condition.
   E. Restore new permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 015100
TEMPORARY UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation, and water.

1.2 RELATED REQUIREMENTS
A. Section 015000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.3 TEMPORARY ELECTRICITY
A. Cost: By Owner.
B. Connect to Owner’s existing power service.
   1. Do not disrupt Owner’s need for continuous service.
   2. Exercise measures to conserve energy.
   3. Coordinate use and connections with Owner.
C. Provide temporary electric feeder from existing building electrical service at location as directed.
D. Complement existing power service capacity and characteristics as required.
E. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.
F. Provide main service disconnect and over-current protection at convenient location.
G. Permanent convenience receptacles may be utilized during construction.
H. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES
A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft (21 watt/sq m).
B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
C. Maintain lighting and provide routine repairs.

1.5 TEMPORARY HEATING
A. Cost of Energy: By Construction Manager.
B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
D. Owner’s existing heat plant may be used as permitted by the Owner.
   1. Exercise measures to conserve energy.
   2. Coordinate use and connections with the Owner.
E. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.6 TEMPORARY COOLING
A. Cost of Energy: By Construction Manager.
B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F (26 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

1.7 TEMPERARY VENTILATION

A. Ventilate enclosed areas to assist curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors or gases.

1.8 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

D. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

1.9 REMOVAL OF TEMPORARY UTILITIES

A. Remove temporary utilities prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION
SECTION 015611
TEMPORARY DUST, FUME, AND ODOR CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Dust and fume emission control is required to maintain a healthful healing environment for patients and users, maintain good public relations with neighbors and employees, prevent damage, minimize cleaning and maintenance costs, and to comply with regulations and laws. All contractors (including subcontractors, lower-tier subcontractors, and suppliers) are required to control dust and fume emissions from their operations and/or activities.

B. The work includes the control of all nuisance or noxious dust, vapors, fumes, odors or emissions caused by construction, demolition, renovation, restoration, or related activities including, but not limited to sawing, cutting, grinding, sanding, abrading, sweeping, crushing, scraping, gluing, prying, plowing, heating, finishing, painting, welding, torch cutting or burning, or any other related processes that can create noxious dust, fumes or odors.

C. No visible emissions or unreasonable odors shall be permitted outside the work area.

D. All products to be used, that could potentially emit dusts, fumes, vapors or odors, and so forth, shall be submitted to the Architect with accompanying MSDS for approval prior to the use of the product.

1.2 RELATED REQUIREMENTS

A. Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

B. Section 015100 - TEMPORARY UTILITIES.

C. Section 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS.

1.3 REFERENCE STANDARDS

A. The Contractor is responsible for compliance with all applicable federal, state, county and municipal laws, regulations and ordinances including, but not limited to, those listed below, which are incorporated by reference.

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

1.4 DEFINITIONS

A. In addition to the terms listed below, all definitions in the laws and regulations specified elsewhere in this Section are incorporated by reference, whether or not restated herein.

B. Architect of Record (AOR): means the entity that assembles the overall documents and bid package, and approves the completed work.

C. Board Authorized Representative: The entity responsible for overall project coordination and completion.

D. General Contractor (GC): Or in case of stand-alone projects Abatement Contractor means the entity responsible for performing the complete scope of work in the Documents. The GC may elect to self-perform or subcontract out any portion of the work.

E. Construction Manager (CM): Or in case of stand-alone projects Abatement Contractor means the entity responsible for performing the complete scope of work in the Documents. The GC may elect to self-perform or subcontract out any portion of the work.

F. HEPA Filter: A High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
G. **MSD**: Material Safety Data Sheets, required by OSHA for any chemical in the workplace that could be expected to cause an exposure to workers during normal use or in emergency situations.

H. **Plasticize**: To apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

I. **Personal Protective Equipment (PPE)**: Protective suits, head and foot covers, gloves, respirators and other items used to protect persons from potential hazard.

J. **Work Area**: The area or areas where work is being conducted.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 **BARRIERS OR WORK AREA ISOLATION**

A. Contractors shall prevent the spread of dust, fumes and odors from their immediate work areas by:

1. Erecting dust-tight barriers between indoor work areas and adjacent occupied areas.
   a. Construction barriers may be used for this purpose if suitably constructed to prevent dust, fume or odor migration.

2. Closing and or covering windows, intake vents, louvers, or other building openings in the immediate vicinity of outdoor work, sufficient to prevent dust, fume or odor migration into the building interior. If such openings cannot be adequately sealed by closing, then poly sheeting, tape, or other impermeable covers shall be used.

3. The Contractor shall provide a filtered, local exhaust system for the isolated work area.

B. Contractor is prohibited from creating other hazardous or uncomfortable conditions for building occupants, such as very hot, humid, cold, or other conditions created by ventilation system alterations or blockages, closed or open windows in hot or cold weather conditions.

C. Contractor is responsible for making itself familiar with building conditions and shall take care to isolate its work area in such a manner that building occupant activities and comfort are not unreasonably disrupted.

3.2 **DUST, FUME AND ODOR CONTROL**

A. Dust, fume or odor release shall be prevented by a suitable means, including but not limited to:

1. Portable HEPA Ventilation & Vacuum Systems
2. Tools equipped with shrouds, HEPA filter equipped vacuum pickups.
3. Alteration, shut down, or isolation of building ventilation systems in the immediate work vicinity.
4. Shrouding around work activities.
5. Shrouding stages, scaffolds, or other work platforms.
6. Local exhaust ventilation systems exhausted to the outside of the building.
7. Wet work methods.

B. It is the Contractor’s responsibility to select the means and methods it considers most suitable to achieve dust, fume and odor control.

C. In the event that dust or fumes escape from the work area or create dirty conditions or contamination to nearby building spaces or grounds, the Contractor is responsible for all costs associated with the cleaning, testing and/ or repair deemed necessary by the Owner.

END OF SECTION
PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. General product requirements.
   B. Re-use of existing products.
   C. Transportation, handling, storage and protection.
   D. Product option requirements.
   E. Substitution limitations.
   F. Procedures for Owner-supplied products.
   G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS
   A. Section 014000 - Quality Requirements: Product quality monitoring.
   B. Section 016200 - Product Substitutions: Procedures for requesting product substitutions.

1.3 SUBMITTALS
   A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
      1. Submit within 15 days after date of Agreement.
      2. For products specified only by reference standards, list applicable reference standards.
   B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
   C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
   D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
      1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
   E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

PART 2 - PRODUCTS

2.1 EXISTING PRODUCTS
   A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
   B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
   C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Construction Manager; remove from site.

2.2 NEW PRODUCTS
   A. Provide new products unless specifically required or permitted by Contract Documents.
   B. Use of products having any of the following characteristics is not permitted:
1. Made using or containing CFC's or HCFC's.
2. Made of wood from newly cut old growth timber.

C. Where other criteria are met, Construction Manager shall give preference to products that:
   1. Are extracted, harvested, and/or manufactured closer to the location of the project.
   2. Have longer documented life span under normal use.
   3. Result in less construction waste. See Section 017419
   4. Are made of vegetable materials that are rapidly renewable.

2.3 GENERAL ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS

A. General: Prohibit the use of or incorporation into the work of materials which contain toxic, hazardous and harmful materials.
   1. Hazardous materials: Defined as pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA), the International Agency for Research on Cancer (IARC) or regulated under OSHA Hazard Communication Standard, 29 CFR 1910.1200.
   2. Harmful materials: Defined as materials which contain the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.
   3. Owner restricted materials: Defined as all products to which the Owner has a reasonable objection because of its content, composition, properties, or characteristics.

B. Vapors, Gases, Fumes, Odors:
   1. General: Comply with all state and federal VOC requirements. Where ever possible use non-VOC materials.
      a. Limit use of products to the greatest extent possible which have "off-gassing", fumes, flammability, and other harmful characteristics.
         1) Prohibit use of products which contain substances that contribute significantly to the production of photochemical smog, tropospheric ozone, or poor indoor-air quality.
      b. Limit use of ozone-depleting compounds to the greatest extent possible. An ozone-depleting compound is any compound with an ozone-depletion potential greater than 0.01 (CFC 11 = 1).
      c. Use organic and biodegradable cleaners to the greatest extent possible.
   2. Do not install, use for installation, and use for cleaning those materials which may produce objectionable (to Owner and public) vapors, gases, fumes, odors, or similar conditions.
   3. Do not install or use products which may have possible chemical or biological reactions with other on-site materials.

C. Toxicity of prefabricated wood products (composite wood and agrifiber products): Products shall contain no added urea-formaldehyde resins.
   1. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

D. Adhesives: Provide adhesives approved by the manufacturers of the products being adhered which are Low-VOC or non-VOC, non-flammable, water-proof after cured, and odor free.

2.4 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
2.5 MAINTENANCE MATERIALS
   A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
   B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.1 SUBSTITUTION PROCEDURES - BIDDING PHASE
   A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
   B. Substitution Submittal Procedure:
      1. Limit each request to one proposed substitution.
      2. Submit request per requirements of Section 016200 - Product Substitutions using "Substitution Request Form" cover sheet, see Section 016200.01 - Substitution Request Form.

3.2 OWNER-SUPPLIED PRODUCTS
   A. Owner's Responsibilities:
      1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Construction Manager.
      2. Arrange and pay for product delivery to site.
      3. On delivery, inspect products jointly with Construction Manager.
      4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
      5. Arrange for manufacturers' warranties, inspections, and service.
   B. Construction Manager's Responsibilities:
      1. Review Owner reviewed shop drawings, product data, and samples.
      2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
      3. Handle, store, install and finish products.
      4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING
   A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
   B. Transport and handle products in accordance with manufacturer's instructions.
   C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
   D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
   E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
   F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION
   A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
   B. Store and protect products in accordance with manufacturers' instructions.
   C. Store with seals and labels intact and legible.
D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Prevent contact with material that may cause corrosion, discoloration, or staining.

I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 016200
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Product substitutions.

1.2 RELATED SECTIONS
A. Section 016000 - PRODUCT REQUIREMENTS: Product requirements.

1.3 SUBSTITUTIONS
A. Base Bid shall be in accordance with the Contract Documents.
B. After the end of the bidding period, substitution requests will be considered by the Architect only in case of:
   1. Product unavailability.
   2. Other conditions beyond the Construction Manager's control.
C. Substitutions will not be considered for acceptance when:
   1. A substitution is indicated or implied on shop drawings or product data submittals without a formal request from the Construction Manager.
   2. Acceptance will require substantial revision of Contract Documents.
   3. In the judgement of the Architect, the substitution request does not include adequate information necessary for a complete evaluation.
   4. Requested directly by a subcontractor or supplier.
D. The Architect will determine acceptability of proposed substitutions.
E. No verbal or written approvals other than by Addendum or Change Order will be valid.

1.4 SUBMITTALS
A. Submit a separate request for each substitution. Support each request with complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
   1. Product identification, including manufacturer’s name and address.
   2. Manufacturer's literature, identifying:
      a. Product description.
      b. Reference standards.
      c. Performance and test data.
   3. Samples, as applicable.
   4. Name and address of similar projects on which product has been used and date of each installation.
   5. Itemized comparison of the proposed substitution with product specified, listing significant variations.
   6. Data relating to changes in construction schedule.
   7. Effects of substitution on separate contracts.
   8. List of changes required in other work or products.
   9. For post-bid substitution requests, accurate cost data comparing proposed substitution with product specified, including amount of net change to the Contract Sum.
   10. Designation of required license fees or royalties.
   11. Designation of availability of maintenance services and sources of replacement materials.

1.5 QUALITY ASSURANCE
A. In making formal request for substitution the Construction Manager represents that:
   1. The proposed product has been investigated and it has been determined that it is equivalent to or superior in all respects to the product specified.
2. The same warranties or bonds will be provided for the substitute product as for the product specified.
3. Coordination and installation of the accepted substitution into the Work will be accomplished and changes as may be required for the Work to be complete will be accomplished.
4. Claims for additional costs caused by substitution that may subsequently become apparent will be waived by the Construction Manager.
5. For post-bid substitution requests, complete cost data is attached and includes related costs under the Contract, but does not include:
   a. Costs under separate contracts.
   b. The Architect's costs for redesign or revision of the Contract Documents.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION
   A. Do not order or install substitute products without written acceptance of the Architect.

3.2 PRODUCT SUBSTITUTION REQUEST FORM
   A. Refer to Document 016200.01 - SUBSTITUTION REQUEST FORM, following this section.
   B. Substitutions will be considered only when the Substitution Request Form is completed and included with the substitution request and back-up data.
   C. All product substitution requests shall be made to the Architect through the Construction Manager.

END OF SECTION
SECTION 016200.01
SUBSTITUTION REQUEST FORM

E4H ENVIRONMENTS FOR HEALTH ARCHITECTURE
23 Drydock Ave., Suite 23-610W
Boston, MA 02210
Contact: Luke Thiboutot, Senior Associate
Phone: 617.772.0260
Email: lthiboutot@e4harchitecture.com

We hereby submit for your consideration the following product instead of the specified item:

DRAWING NO. ________ DRAWING NAME ____________________________

SPEC. SECT. SPEC NAME PARAGRAPH SPECIFIED ITEM
______ ______________ __________

Proposed Substitution: _____________________________________________________

Attach complete information on changes to Drawings and/or Specifications that proposed substitution will require for its proper installation.
Submit with request necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer’s literature to indicate equality in performance.
The undersigned certifies that the function, appearance and quality are of equal performance and assumes liability for equal performance, equal design and compatibility with adjacent materials.

Submitted By:

_____________________________________________ ____________________________
Signature (Construction Manager)                                               Title

_____________________________________________
Name
_____________________________________________
Firm
_____________________________________________
Address
_____________________________________________
Telephone                                                                                      Date

Signature shall be by person having authority to legally bind the Construction Manager to the above terms. Failure to provide legally binding signature will result in retraction of approval.

(See second page for additional information to be provided)
Fill in blanks below:

Does the substitution affect dimensions indicated on the Drawings?
Yes ____ No _____ if yes, clearly indicate changes.

Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?
Yes ____ No _____ if no, fully explain:

What effect does the substitution have on other Contracts or other trades?

What effect does the substitution have on construction schedule?

Manufacturer’s warranties of the proposed and specified items are:
Same _____ Different _____ Explain:

Reason for Request:

Itemized comparison of specified item(s) with the proposed substitution; list significant variations:

This substitution will amount to a credit or extra cost to the Owner of:

Designation of maintenance services and sources:

(Attach additional sheets if required)

For use by the Architect
___ Recommended ___ Recommended as noted
___ Not Recommended ___ Insufficient data received
By ........................................ Date ........................................

For use by the Owner
___ Approved ___ Approved as noted
___ Not Approved ___ Insufficient data received
By ........................................ Date ........................................

END OF SECTION
EXECUTION AND CLOSEOUT REQUIREMENTS

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Examination, preparation, and general installation procedures.
B. Pre-installation meetings.
C. Cutting and patching.
D. Surveying for laying out the work.
E. Cleaning and protection.
F. Starting of systems and equipment.
G. Demonstration and instruction of Owner personnel.
H. Closeout procedures, except payment procedures.
I. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS
A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
B. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
C. Section 014000 - Quality Requirements: Testing and inspection procedures.
D. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
   1. Temporary exterior enclosures.
   2. Temporary interior partitions.
E. Section 015100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
F. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
G. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
H. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.
C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
5. Work of Owner or separate Contractor.
6. Include in request:
   a. Identification of Project.
   b. Location and description of affected work.
   c. Necessity for cutting or alteration.
   d. Description of proposed work and products to be used.
   e. Effect on work of Owner or separate Contractor.
   f. Written permission of affected separate Contractor.
   g. Date and time work will be executed.
D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5 QUALIFICATIONS
A. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.6 PROJECT CONDITIONS
A. Use of explosives is not permitted.
B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
   2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7 COORDINATION
A. See Section 011000 for occupancy-related requirements.
B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
C. Notify affected utility companies and comply with their requirements.
D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
EXECUTION AND CLOSEOUT REQUIREMENTS

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E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK
A. Verify locations of survey control points prior to starting work.
B. Promptly notify Architect of any discrepancies discovered.
C. Construction Manager shall locate and protect survey control and reference points.
D. Control datum for survey is that indicated on drawings.
E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
H. Utilize recognized engineering survey practices.
I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
K. Periodically verify layouts by same means.
L. Maintain a complete and accurate log of control and survey work as it progresses.
M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS
A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING
A. Whenever possible, execute the work by methods that avoid cutting or patching.
B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
EXECUTION AND CLOSEOUT REQUIREMENTS

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7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

E. Clean up spillage and wind-blown debris from adjacent public and private lands.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Prohibit traffic from landscaped areas.

H. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.
3.9 SYSTEM STARTUP
A. Coordinate schedule for start-up of various equipment and systems.
B. Notify Architect and Owner seven days prior to start-up of each item.
C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable Construction Manager personnel and manufacturer's representative in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION
A. See Section 017900 - Demonstration and Training.
B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.11 ADJUSTING
A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING
A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
B. Use cleaning materials that are nonhazardous.
C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
F. Clean filters of operating equipment.
G. Clean debris from roofs, gutters, downspouts, and drainage systems.
H. Clean site; sweep paved areas, rake clean landscaped surfaces.
I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Substantial Completion.

D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

F. Accompany Project Coordinator on preliminary final inspection.

G. Notify Architect when work is considered finally complete.

H. Complete items of work determined by Architect's final inspection.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION
SECTION 017329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Examination of existing conditions and acceptance of conditions.

B. Administrative and procedural requirements for cutting and patching, including attendant excavation and backfill as required to complete the Work. Contractors are responsible for coordinating all cutting and patching work, including but not limited to:

1. Perform all cutting, altering, patching, and fitting of the Work (new and existing) as necessary for the Work and the existing improvements. Fully integrate with existing and new construction, all cutting, alterations and patching, to present the visual appearance of an entire, completed, and unified project.
   a. Make all products and their components of the work fit together properly.

2. Provide openings in elements of the Work, and the patching of same, for penetrations required by all trades, including but not limited to mechanical, plumbing, fire protection and electrical work.
   a. Individual subcontract trades are responsible for designated types of coring and drilling penetrations for piping, conduit, ducts and other penetrations as defined elsewhere in this Section.

3. Uncover work to provide for installing, inspecting, or both, of ill-timed work;

4. Remove and replace work not conforming to requirements of the Contract Documents or as otherwise determined to be defective.

5. Patch and match all surfaces and products disturbed or damaged by the Work.

6. Remove samples of installed work as specified for testing.

1.2 RELATED REQUIREMENTS

A. Individual Product Specification Sections:

1. Cutting and patching of not-exposed-to-view materials incidental to work of the Section.

2. Core drilling (up to 8 inches in diameter) of interior building components, incidental to work of individual Sections.

3. Cutting and Patching work of particular exposed-to-view finish work, performed by trades as specified herein.

1.3 SUBMITTALS

A. Submit written proposals to perform cutting and patching under provisions of Section 013000 - ADMINISTRATIVE PROCEDURES. Describe cutting and patching procedures in advance of the time cutting and patching.

1. Submit a written request when cutting work affects the following:
   a. Structural integrity of any element in the project.
   b. Integrity of weather-exposed or moisture-resistant elements.
   c. Integrity of any fire suppression, fire alarm, or life safety system.
   d. Interruption or disturbance of utilities service. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
   e. Efficiency, maintenance, or safety of operational elements and systems.
   f. Aesthetic and visual qualities of exposed-to-view elements.
   g. Efficiency, operational life, maintenance, or safety of operational elements.
   h. Work of Owner or work performed under separate Contract.
   i. Owners on-going operations or schedule.

2. Include in the request:
   a. Identification of project.
   b. Location and description of affected work.
c. Necessity for cutting or alteration.

d. Alternatives to cutting and patching.

e. Scope of proposed cutting, patching, alteration or excavation.

f. List of tradespeople who will execute the work.

g. Description of products to be used.

h. Extent of refinishing and cleaning to be performed.

i. Effect on work by Owner or work performed under separate Contract, and written permission of affected party.

j. Date and time cutting and patching is scheduled to be executed.

k. Cost proposal, when applicable.

l. Written permission of separate contractor(s) whose work will be affected.

3. Review by the Architect does not waive the Architect's right to later require complete removal and replacement of Work found to be unsatisfactory.

4. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit a request for substitution in accordance with Section 016200 - PRODUCT SUBSTITUTIONS.

1.4 QUALITY ASSURANCE

A. Only tradespersons skilled and experienced in cutting and patching shall perform such Work.

B. In performing Work which requires cutting, fixing, or patching, Contractor shall oversee and ensure contractor(s) and subcontractors utilize best efforts to protect and preserve the visual appearance and aesthetics of the Project to the reasonable satisfaction of both Owner and Architect.

C. In performing Work which requires cutting, fixing, or patching, Contractor and subcontractors shall utilize best efforts to protect and preserve the visual appearance and aesthetics of the Project to the reasonable satisfaction of both Owner and Architect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance Requirements: Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.

B. Structural Elements: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Always obtain written approval of the cutting and patching proposal before cutting and patching structural elements.

1. Do not drill through structural beams, slabs or columns. Core drilling through concrete block walls and stair platforms must be approved by the Architect.

2. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

C. Exposed Elements:

1. Employ original installer of new construction to perform cutting and patching for weather exposed and moisture resistant elements, and sight exposed surfaces.

2. Employ an appropriate tradesperson to perform cutting and patching of existing weather-exposed and moisture-resistant construction, and exposed-to-view surfaces.

D. Penetrating Elements: Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.

E. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
1. General: Restore work with new products in accordance with the requirements of the Contract Documents.

2. Engage a firm recognized and experienced in the trade or specialty operation required to cut and patch the exposed-to-view work listed below.
   a. Concrete masonry and brick masonry concrete.
   b. Windows, storefront and curtainwall wall systems.
   c. Gypsum and plaster work.
   d. Acoustical ceilings.
   e. Carpeting.
   f. Resilient flooring.
   g. HVAC enclosures, cabinets, or covers.

3. Engage a firm recognized and experienced in firestopping for patching of existing firestopping, smoke seals and firesafing in compliance with applicable codes and as additionally required by authorities having jurisdiction. Comply with requirements of Section 078400 - FIRESTOPPING.

F. Operational and Safety Limitations: Do not cut and patch operating elements or safety components in a manner that would reduce their capacity to perform as intended, or would increase maintenance, or decrease operational life or safety.

   1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
      a. Primary operational systems and equipment.
      b. Fire resistance rated barriers and smoke barriers.
      c. Water, moisture, or vapor barriers.
      d. Membranes and flashings.
      e. Fire protection systems.
      f. Noise and vibration control elements and systems.
      g. Control systems.
      h. Communication systems.
      i. Conveying systems.
      j. Electrical wiring systems.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Materials: Use patching materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance will equal or surpass that of the existing materials. Comply with specifications and standards for each specific product involved.

   1. All materials used shall be approved by the Architect for consistency with the existing surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Pre-Bid Examination: Contractors shall inform themselves of existing conditions before submitting bids, and are fully responsible for carrying out all work required to completely and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions which are inconsistent with those assumed, except for fully concealed conditions.
B. Examination: Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, inspect conditions affecting performance of work. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.2 PREPARATION

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing damage to structure surfaces, equipment, or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

B. Protection:
   1. Provide temporary supports to ensure structural integrity of the Work.
   2. Protect existing construction during cutting and patching to prevent damage.
   3. Provide protection from adverse weather conditions.
   4. Provide protection from elements for areas which may be exposed by uncovering work.

3.3 GENERAL CUTTING AND PATCHING

A. Performance: Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive repairs, patching, and finishing.

B. Execute cutting, fitting, and patching, including excavation and fill, to complete the work.
   1. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not permitted without prior approval, from Architect.
   2. Fit products together, to integrate with other work.
   3. Uncover work to install ill-timed work.
   4. Remove and replace defective or non-conforming work.
   5. Remove samples of installed work for testing, when requested.
   6. Provide openings in the work for penetration of mechanical and electrical work.

C. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
   1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
   3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
   4. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

3.4 FINISHING OF PATCHED AREAS:

A. General: Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break; for assemblies, refinish entire unit.
   1. Patching: Patch with durable seams that are as invisible as possible, showing no evidence of patching and refinishing. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction. Comply with specified tolerances.
2. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.
3. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Provide vapor and air seal when penetrating existing vapor and air seals.
4. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
5. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat. Extend re-painting to entire surface plane up to where plane changes direction.
6. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.5 CORING AND DRILLING

A. Coring and drilling of holes incidental to work of individual sections shall be performed by the trade requiring the penetration, except as follows:
   1. Coring and drilling of holes greater than 8 inches in diameter in concrete decks and slabs.
   2. Coring and drilling requiring patching of the following existing surfaces shall be performed by the trade requiring the penetration with patching performed by the appropriate trade subcontractor.
      a. Gypsum board
   3. The Construction Manager is responsible for performing core drilling in wall and roof surfaces leading to, or from, the outside of the Building.
   4. The Construction Manager is responsible for coordination of all coring and drilling and resultant patches necessary for the completion of this Contract and for the quality and appearance of all patch Work in exposed-to-view finished materials.

3.6 CLEANING

A. Cleaning patched areas: Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and similar items.

END OF SECTION
SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes administrative and procedural requirements for the following:
   1. Recycling nonhazardous construction waste.
   2. Disposing of nonhazardous construction waste.

1.2 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 015000 - TEMPORARY FACILITIES and CONTROLS: Environmental protection
   measures during construction, and location of waste containers at Project site.

1.3 REFERENCE STANDARDS
A. ASTM E1609 - Standard Guide for Development and Implementation of a Pollution Prevention
   Program.

1.4 DEFINITIONS
A. **Clean**: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
B. **Construction and Demolition Waste**: Solid wastes typically including building materials,
   packaging, trash, debris, and rubble resulting from construction, remodeling, repair and
   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. **Hazardous**: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity,
   toxicity or reactivity.
E. **Nonhazardous**: Exhibiting none of the characteristics of hazardous substances, i.e.,
   ignitibility, corrosivity, toxicity, or reactivity.
F. **Nontoxic**: Neither immediately poisonous to humans nor poisonous after a long period of
   exposure.
G. **Recyclable**: The ability of a product or material to be recovered at the end of its life cycle and
   remanufactured into a new product for reuse by others.
H. **Recycle**: To remove a waste material from the project site to another site for remanufacture
   into a new product for reuse by others.
I. **Recycling**: The process of sorting, cleansing, treating and reconstituting solid waste and other
   discarded materials for the purpose of using the altered form. Recycling does not include
   burning, incinerating, or thermally destroying waste.
J. **Return**: To give back reusable items or unused products to vendors for credit.
K. **Reuse**: To reuse a construction waste material in some manner on the project site.
L. **Salvage**: To remove a waste material from the project site to another site for resale or reuse
   by others.
M. **Sediment**: Soil and other debris that has been eroded and transported by storm or well
   production run-off water.
N. **Source Separation**: The act of keeping different types of waste materials separate beginning
   from the first time they become waste.
O. **Toxic**: Poisonous to humans either immediately or after a long period of exposure.
P. **Trash**: Any product or material unable to be reused, returned, recycled, or salvaged.
Q. **Waste**: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.5 **PERFORMANCE GOALS**

A. **General**: Develop waste management plan that results in end-of-Project rates for recycling of **75 percent** by weight of total waste generated by the Work.

B. **Recycle Goals**: Owner's goal is to salvage and recycle as much nonhazardous construction waste as possible. Owner has established minimum goals for the following materials:

1. **Demolition Waste** includes:
   a. Asphaltic concrete paving.
   b. Concrete.
   c. Metal Fencing
   d. Electrical conduit.
   e. Copper wiring.
   f. Lighting fixtures.
   g. Lamps.
   h. Ballasts.
   i. Electrical devices.

2. **Construction Waste** includes:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber.
   d. Wood sheet materials.
   e. Wood trim.
   f. Metals.
   g. Roofing.
   h. Insulation.
   i. Carpet and pad.
   j. Gypsum board.
   k. Piping.
   l. Electrical conduit.
   m. **Packaging**: Regardless of salvage/recycle goal indicated above, salvage or recycle **100 percent** of the following uncontaminated packaging materials:
      1) Paper.
      2) Cardboard.
      3) Boxes.
      4) Plastic sheet and film.
      5) Polystyrene packaging.
      7) Plastic pails.

1.6 **SUBMITTALS**

A. **Waste Management Plan**: Submit a copy of the plan within 30 days of date established for commencement of the Work.

B. **Waste Reduction Progress Reports**: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste recycled, both estimated and actual in tons.
5. Total quantity of waste recovered (recycled) in tons.
6. Total quantity of waste recovered (recycled) as a percentage of total waste.
7. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Records of Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.7 QUALITY ASSURANCE

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

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
   1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with Section 015000 - TEMPORARY FACILITIES and CONTROLS for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project. Superintendent may be the waste management coordinator.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. 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.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Section 015000 - TEMPORARY FACILITIES and CONTROLS for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING 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 Owner.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
   1. Provide appropriately marked containers or bins for controlling recyclable waste until they are 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 off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE
A. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
B. Polystyrene Packaging: Separate and bag materials.
C. 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.
D. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
E. Site-Clearing Wastes: Chip brush, branches, and trees on-site or at landfill facility.
   1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.
F. 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 Division 32 Section "Plants." for use of clean sawdust as organic mulch.
G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

3.4 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 to 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: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION
SECTION 017800
CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Project Record Documents.
   B. Operation and Maintenance Data.
   C. Warranties and bonds.

1.2 RELATED REQUIREMENTS
   A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
   B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
   C. Individual Product Sections: Specific requirements for operation and maintenance data.
   D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS
   A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
   B. Operation and Maintenance Data:
      1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
      2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
      3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
      4. Submit two sets of revised final documents in final form within 10 days after final inspection.
   C. Warranties and Bonds:
      1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
      2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
      3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PROJECT RECORD DOCUMENTS
   A. Maintain on site one set of the following record documents; record actual revisions to the Work:
      1. Drawings.
      2. Specifications.
      3. Commissioning Agent Specifications.
      4. Addenda.
      5. Change Orders and other modifications to the Contract.
      6. Reviewed shop drawings, product data, and samples.
      7. Manufacturer's instruction for assembly, installation, and adjusting.
   B. Ensure entries are complete and accurate, enabling future reference by Owner.
   C. Store record documents separate from documents used for construction.
D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer’s instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Fire/Smoke contribution characteristics.
   3. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer’s recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.


D. Additional information as specified in individual product specification sections.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.
D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide Construction Manager's coordination drawings, with color coded piping diagrams as installed.

L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

N. Include test and balancing reports.

O. Additional Requirements: As specified in individual product specification sections.

3.5 OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Construction Manager and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

K. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
1. **Part 1**: Directory, listing names, addresses, and telephone numbers of Architect, Construction Manager, Subcontractors, and major equipment suppliers.

2. **Part 2**: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. **Part 3**: Project documents and certificates, including the following:
   a. Shop drawings and product data.

### 3.6 OPERATION AND MAINTENANCE MANUALS

**A. General**: Coordinate content and submission requirements of operation and maintenance manuals with Owner’s Commissioning Agent.

**B. Prepare data in the form of an instructional manual.** Furnish manuals which contain all of the following groups of equipment:

1. Food service equipment.
2. Elevators.
3. Wheelchair lift.
4. Special equipment and systems.
5. Fire protection system.
6. Utilities and plumbing systems.
7. Heating, ventilation and air conditioning system.
8. Electrical systems.

**C. Furnish bound and properly identified Manuals prior to request for Final Acceptance.**

1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three “D ring” capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers.
   a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
      1) Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches; locate pocket inside rear cover or bound in with text.
   b. Each manual shall include the same following minimum information:
      1) Table of Contents.
      2) Directory of Contractor, subcontractors, and major equipment supplies listing addresses, phone numbers and appropriate emergency phone numbers.
         (a) Include local sources of supplies and replacement parts.
      3) Directory of Architect and consultants listing addresses and phone numbers.
      4) Operation and maintenance instructions. Provide schematic diagrams of control systems, circuit directories for each electric panel and charts showing the tagging of all valves.
      5) Air and water test and balancing reports.
      6) Maintenance and cleaning instructions for finishes.
      7) Product and manufacturer’s Certificates.
      8) Photocopies of all extended warranties and bonds.
c. Submit one copy of completed volume in final form 21 days prior to Final Inspection. This copy will be returned after final inspection with Architect's comments; Revise and submit all volumes to Owner.

D. For each item of equipment, include description of equipment, component parts and accessories. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts. Additionally provide the following for each item:

1. Panelboard circuit directories: Provide electrical service characteristics, controls and communications.
   a. Include color coded wiring diagrams as installed.
   b. Operating procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
   c. Maintenance requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and re-assembly instructions; alignment, adjusting, balancing, and checking instructions.
      1) Maintenance drawings: Supplement product data to illustrate relation of component parts of equipment and systems, to show control and flow diagrams. Do not use project Record Documents as maintenance drawings.
   d. Provide servicing and lubrication schedule, and list of lubricants required.
   e. Include manufacturer's printed operation and maintenance instructions.
   f. Include sequence of operation by controls manufacturer.
   g. Provide control diagrams by controls manufacturer as installed.
   h. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
   i. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
   j. Provide original manufacturer’s parts (OEM) list, illustrations assembly drawings, and diagrams required for maintenance.
      1) Provide list of original manufacturer’s spare parts (OEM), current prices, and recommended quantities to be maintained in storage.
      2) Include local source of supplies and replacement parts, and any other data pertinent for procurement procedures.
   k. Additional requirements: As specified in individual specification Sections.

E. Standards:

1. Measurements: Provide all measurements in U.S. standard units such as feet and inches, pounds, and cfm; provide additional measurements in the "International System of Units" (SI).
   a. Abbreviations: Provide complete nomenclature of all parts of all equipment; include part numbers of all replaceable parts.

3.7

3.8 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.
E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

END OF SECTION
SECTION 017900
DEMONSTRATION AND TRAINING

PART 1  GENERAL

1.1  SUMMARY
A. Demonstration of products and systems where indicated in specific specification sections.
B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Items specified in individual product Sections.
C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.2  RELATED REQUIREMENTS
A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.
B. Section 019113 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

1.3  SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such as slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Construction Manager.
C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.


1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
B. Demonstration may be combined with Owner personnel training if applicable.
C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.
B. Owner will provide classroom and seating at no cost to Construction Manager.
C. Provide training in minimum two hour segments.
D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Construction Manager for personnel "show-up" time.
E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.
F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Construction Manager.
11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION
SECTION 024100
DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Selective demolition of building elements for alteration purposes.
   1. General: The work described in this Section consists of selective demolition, cleaning, removal and legal disposal of all structures, equipment and materials indicated for demolition, or careful removal and temporary storage of materials and equipment indicated for salvage and re-use, or salvage and delivery to Owner. No attempt is made in this Section to list the entire scope of selective demolition required on this project or to describe each element to be removed. Drawings indicate both existing construction and final construction. It is the responsibility of the contractors to determine for themselves the scope and nature of the existing materials, equipment and finishes required for removal or salvage, based on the information provided in the full set of Contract Documents.

B. Permits: Obtain and pay for all demolition and construction permits required by local authorities having jurisdiction and other regulatory agencies and utility companies.

C. Selective demolition and removal work of building elements for alteration purposes, includes, but is not limited to:
   1. Refer to Drawing AD101 for scope of demolition work.
   2. Demolition work as indicated on the Drawings, shall be conducted after normal working hours, and shall be coordinated with the Owner and Architect.
   3. Remove all furnishings, utilities, equipment and fixtures, not indicated for salvage or re-use, and abandoned materials of all kinds.
   4. Remove from site all abandoned, disconnected and dismantled fire protection, plumbing and mechanical equipment, including piping, conduits, system wiring, meters and other devices.
   5. Remove from site all abandoned, disconnected and dismantled electrical fixtures and equipment, including conduits, wiring, meters and other devices.
   6. In addition to demolition specifically shown, cut, move or remove existing construction to remain as necessary to provide access or to allow alterations and new work to proceed. Coordinate such relocation's and removal to accommodate the demands and requirements of other trades.
   7. Remove and return to owner unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, remove debris such as rotted wood, rusted metals and deteriorated concrete.

D. Selective demolition and removal work by individual utility, mechanical and electrical trade subcontractors includes, but is not limited to the following:
   1. Each trade subcontractor shall disconnect cut, cap and make safe all utilities, equipment and fixtures which are not indicated for salvage or re-use, or otherwise indicated to be abandoned in place as well as any abandoned materials of any kind.
      a. Disconnect cut, cap and make safe, all utility services indicated to be demolished at their primary source. Obtain the approval from authorities having jurisdiction, or applicable service provider prior to the execution of the work.
      b. Cut, cap and make safe all existing utility services indicated to be abandoned in place, where so indicated on the Drawings.
   2. The plumbing subcontractor shall disconnect, detach and dismantle all existing abandoned plumbing systems and equipment including, but not limited to, fixtures, equipment, water heaters, piping, hangers, valves, insulation and appurtenances.
      a. Piping at slab will be disconnected by plumbing contractor.
      b. Suspended hangers, piping, equipment, fixtures and appurtenances scheduled for demolition, shall be disconnected and lowered to floor by the plumbing subcontractor.
3. The HVAC subcontractor shall disconnect, detach, dismantle all existing abandoned heating, ventilating, and air conditioning systems including, but not limited to, air handlers, air conditioners, pumps, cabinet unit heaters, unit heaters, radiation, exhaust fans, intakes, louvers, diffusers, grilles, and all related piping, ductwork, controls, and appurtenances.
   a. Suspended hangers, equipment, ductwork and appurtenances scheduled for demolition, shall be disconnected and lowered to floor by the HVAC subcontractor.

4. The Electrical subcontractor shall disconnect, detach, dismantle all existing abandoned electrical systems and equipment including, but not limited to, panelboards, light fixtures, fire alarm, intercom, speakers, wiring devices, and all related conduit and appurtenances.
   a. Suspended wiring, conduit, hangers, fixtures, equipment, and appurtenances scheduled for demolition, shall be disconnected and lowered to floor by the electrical subcontractor.

5. Remove, salvage and furnish to the Construction Manager designated equipment, fixtures or other items so identified. Refer to notes on Drawings.

6. Identify locations of utilities for work of other sections.

E. Remove, salvage, and furnish to Owner for maintenance stock, or other future use, the following products. Carefully package and clearly identify prior to delivery to Owner.
   1. Doors.
   2. Door frames.
   3. Door hardware.
      a. Carefully package and clearly identify prior to delivery to Owner.

F. Conduct walk-through of existing site prior to commencement of selective demolition work and jointly identify and tag with Owner items required to be salvaged. These products in general would be in addition to those indicated on Drawings.
   1. All salvaged products not designated for re-use in project, shall be furnished to the Owner for its own use, carefully packaged and clearly identified.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 011000 - Summary:
   1. Section 011000 - Summary: Limitations on Construction Manager's use of site and premises.
   2. Section 011000 - Summary: Sequencing and staging requirements.
   3. Section 011000 - Summary: Areas for temporary construction and field offices.
   4. Section 011000 - Summary: Description of items to be removed by Owner.


D. Section 015100 - Temporary Utilities: Use of temporary or existing utilities during demolition procedures.

E. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

1.3 REFERENCE STANDARDS


1.4 PRE-DEMOLITION CONFERENCE

A. Pre-Demolition Meeting: At least two weeks prior to commencing the work of this Section, conduct a pre-demolition conference at the Project site. Comply with requirements of Section
Co-ordinate time of meeting to occur prior to installation of work under the related sections named below.

1. Required attendees: Architect, Contractor’s project manager and on-site superintendent, demolition subcontractor’s project superintendent, and representatives of related utility trades.

2. Conference Agenda:
   a. Scheduling of demolition operations. Review critical demolition sequencing with other work.
      1) Coordination scheduling with Owner’s ongoing operations.
   b. Coordination of utility service requirements and disconnects.
      1) Review functioning utility services which are to remain in service throughout demolition work.
      2) Review requirements for marking location of disconnected utilities, and project record (as-built) requirements.
   c. Review conditions of existing construction to be demolished.
      1) Review extent and location of selective demolition.
      2) Review special demolition and salvage procedures required for historic building elements.
      3) Exploratory demolition, determination of any potential hazardous materials and concealed conditions.
   d. Coordination of demolition work with work of other contracts.
   e. Review shoring and bracing procedures, and structural load limitations of existing structure.
   f. Review of site use, staging, and storage locations for salvaged materials and materials for recycling program.
   g. Emergency weather protection procedures and weather limitations.
   h. Review conditions of existing construction to be demolished.
   i. Review structural load limitations of existing structure.
   j. Review extent and location of selective demolition. Review areas where existing construction is to remain and requires protection
   k. Review special requirements for temporary protection of existing finishes and materials to remain.
   l. Review requirements of work performed by other trades that rely on substrates exposed by demolition operations.
   m. Procedures for processing field decisions.
   n. Procedures for handling hazardous materials.
   o. Review fire protection procedures for cutting torches, and other potentially hazardous operations.
   p. Review general safety regulations and requirements for demolition work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
E. Design Data: Submit calculations for bracing and shoring, signed and sealed by professional engineer registered in the state in which the project is located.

1.6 QUALITY ASSURANCE

A. General: Conduct the work in a manner giving prime consideration to protection of the public; protection from the weather, control of noise, shocks and vibration; control of dirt and dust; orderly access for and storage of materials; protection of existing buildings; protection of adjacent surfaces and property; coordination and cooperation with the Owner at all times.
   1. Comply with all requirements of this contract relative to protection, scheduling and coordination with the Owner.

B. Shoring and Bracing design: Design shoring, and bracing, under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.

C. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of five (5) years of documented experience.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCOPE

A. Remove portions of buildings as indicated on the Drawings.

B. Remove any items indicated, for salvage and relocation.

3.2 PREPARATION

A. General: Provide necessary protection of non-work areas during demolition operations. Provide, erect and maintain temporary barriers as required to protect non-construction related pedestrian and vehicular traffic using the adjacent portions of the site and building.
   1. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy of adjacent facility.

B. Protect existing structures which are not to be demolished. Protect designated materials and equipment to be removed and retained by Owner.
   1. Cover or otherwise protect as necessary existing equipment, furniture and furnishing located beyond the immediate demolition work.
   2. Protect existing landscaping materials, structures, and appurtenances which are not to be demolished.

C. Prevent movement of structure; provide required bracing and shoring.
   1. Protect existing active utility services and structures from damage during selective demolition work including during installation of bracing and removal of same. Repair or replace damages to satisfaction of Owner.

D. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.3 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permit.
9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin removal until receipt of notification to proceed from Owner.
C. Do not begin removal until built elements to be salvaged or relocated have been removed.
D. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include, but are not limited to; mold, regulated asbestos containing materials, lead, PCB's, and mercury.

3.4 BRACING
   A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace. Provide suitable bracing materials which will support loads imposed
   B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Architect.
   C. Install internal bracing, if required, to prevent spreading or distortion to braced frames.
   D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand designed live and dead loads.
   E. Remove bracing in stages to avoid disturbance or damage to existing structure.
   F. Repair or replace adjacent work damaged or displaced through installation or removal of bracing work.

3.5 EXISTING UTILITIES
   A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
   B. Protect existing utilities to remain from damage.
   C. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
   D. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
   E. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
   F. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
   G. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
3.6 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.
   1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
   2. Remove items indicated on drawings.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated or specified to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal, and specified waste diversion goals.
   2. As work progresses, regularly remove demolished materials from site. Do not allow demolished materials to accumulate on-site, except as required for materials determined to be reused, salvaged, or as required for waste segregation and diversion for recycling.
   3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn or bury demolished materials on site, arrange for legal disposal of the same.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
   1. Comply with waste management reporting requirements on forms acceptable to the Owner.
   2. Record the amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid, transportation costs (if
DANA-FARBER CANCER INSTITUTE

E4H Environments for Health Architecture

Dana 14 Renovation

Project No. 2017069

Boston, MA

March 6, 2020

3.7 DEMOLITION

- Include manifests, weight tickets, receipt, and invoices
- Remove debris, junk, and trash from site.
- Leave site in clean condition, ready for subsequent work.
- Clean up spillage and wind-blown debris from public and private lands.

3.8 REPAIRS

- Repair all damage done to elements of buildings and structures to remain, except repairs specified to be provided under other Sections, or as indicated for removal in subsequent project phase(s). Repairs shall be done in such manner as to closely match construction, appearance and quality of original work.

3.9 SELECTIVE DEMOLITION REQUIREMENTS FOR MATERIALS AND SURFACES

- Remove designated at-grade paving, curbs, gutters, sidewalks, access ramps, and driveways. Remove entirely to limits indicated, provide saw-cut where abutting existing-in-situ paving designated to remain. Comply with requirements of Division 31 - Earthwork.
  1. Where adjacent pavement or concrete designated to remain is broken or deteriorated sufficiently to prohibit a sound replacement, remove the entire deteriorated section to limit determined by the Architect/Engineer.
- Floors, General:
  1. Completely remove existing flooring located in areas scheduled to receive new flooring surfaces and as additionally indicated. Remove all finish flooring layers of flooring down to the existing substrate.
    a. Completely remove flooring systems to substrate, including full removal of all setting beds and adhesives.
  2. Remove resilient flooring and adhesive in strict accordance with the technical bulletin entitled "Recommended Work Practices for the Removal of Resilient Floor Covering", as issued by Resilient Floor Covering Institute (RFCI).
  3. Except for vinyl asbestos tile (VAT), remove resilient flooring and adhesive in strict accordance with the technical bulletin entitled "Recommended Work Practices for the Removal of Resilient Floor Covering", as issued by Resilient Floor Covering Institute (RFCI).
    a. Vinyl asbestos tile (VAT): Existing vinyl asbestos tile flooring shall remain in place and shall not be removed.
    b. Vinyl asbestos tile (VAT): Existing vinyl asbestos tile will be removed by the Owner under separate contract.
    c. Vinyl asbestos tile (VAT): Existing vinyl asbestos tile will be removed by specialist subcontractor as specified under Section 028213 - Asbestos Abatement.
  4. Patching: The Contractor is responsible for patching of flooring substrates and subfloors. Respective finish flooring trades are responsible for patching of finish flooring systems matching abutting surface.
  5. Walls, General:
    a. Remove interior walls and partitions as indicated and as needed to accommodate new work.
    b. Where existing walls-to-remain are indicated to receive new finishes, completely remove trim and fasteners.
    c. Patching: The Contractor is responsible for patching of substrates and back-up systems. Finishes work shall be provided under individual product specification sections.
  6. Ceilings, General:
    a. Patching: The Contractor shall provide patching of substrates and back-up systems. Ceiling work is specified under individual product specification sections.
1) Ceilings which must be temporarily removed for mechanical, plumbing or fire protection work shall be carefully removed and stored for reinstallation when work has been completed under Section 095100 - Acoustical Ceilings.

7. Doors and Frames: Where doors and frames are indicated to be removed from walls or partitions which are to remain, remove doors and frames carefully so as to minimize damage to wall. Repair and patch wall as necessary to accommodate new door frame or other new work.

8. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Section 075419 for roofing requirements.

9. Concrete, General: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

10. Concrete Slabs (suspended and slabs-on-grade): Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

11. Masonry: Demolish in small sections. Except where toothing is required, cut masonry using power-driven saw at junctures with construction to remain. Remove masonry between saw cuts.

12. Fire Suppression and Sprinkler Equipment: Fire Protection subcontractor is responsible to disconnect, cap and lower to floor items required to be removed, including but not limited to piping, hangers, valves, and insulation.

13. Plumbing Equipment: Plumbing subcontractor is responsible to disconnect, cap and lower to floor items required to be removed, including but not limited to fixtures, equipment, water heaters, piping, hangers, valves, and insulation.

14. Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC&R) Equipment:
   a. Drain system components designated for disposal of all lubricants, hydraulics, and refrigerants without releasing into atmosphere.
   b. HVAC&R subcontractor(s) shall disconnect, cap and lower to floor items required to be removed, including but not limited to, ductwork, piping, fans, VAV boxes, unit ventilators, and all similar system equipment. Contractor is responsible for removal from site and proper disposal.

15. Electrical Equipment and Lighting Fixtures:
   C. Electrical subcontractor(s) shall disconnect, cap and lower to floor items required to be removed, including but not limited to, panelboards, light fixtures, and overhead devices including, fire alarm, intercom, bus ducts. Contractor is responsible for removal from site.

3.10 CLEANING

A. Daily cleaning: Sweep all street and roads affected by demolition operations.

B. Upon completion of the work of this Section; remove unused tools and equipment, surplus materials, rubbish, debris, and dust. Leave area in raked or broom-clean condition, as appropriate.

C. Upon completion of the work of this Section; clean adjacent structures and facilities of dust, dirt and debris caused by demolition work to the satisfaction of Owner, owner(s) of adjacent properties, and authorities having jurisdiction.

END OF SECTION
SECTION 030136
RESURFACING AND PATCHING OF CONCRETE SLABS

PART 1 - GENERAL

1.1 SUMMARY
A. Grind down high spots in existing concrete surfaces to specified tolerances.
B. Shot blast clean existing concrete slabs free of dirt, laitance, corrosion, or other contamination ready to receive finish flooring.
C. Prepare substrates, level and patch existing concrete surfaces, and concrete surfaces disturbed by the Work of this Contract, including:
   1. Restore concrete surfaces after conclusion of demolition.
   2. Patch concrete or fill openings, (as indicated on the Drawings) in slabs where trenching has occurred.
D. Prepare existing concrete floors as required to receive sealants/expansion joints as necessary.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 024100 - DEMOLITION: Removal of existing building components and finishes.

1.3 REFERENCES
A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - References. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   1. AASHTO T11 - Standard Method of Test for Materials Finer than 75 mm (No. 200) Sieve In Mineral Aggregates by Washing.
   2. AASHTO T27- Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
   3. ACI 301 - Specifications for Structural Concrete.
   4. ACI 302.2R - Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
   5. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
16. ASTM C1042 - Standard Test Method for Bond Strength of Latex Systems Used with Concrete by Slant Shear.
17. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
18. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
19. CRSI - Concrete Reinforcing Steel Institute.

1.4 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties for proposed patching underlayment.
   2. Concrete Mix Test Reports: Submit Preliminary Design Mix Reports (ACI 301).
   3. Manufacturer’s instructions: Manufacturer’s preparation, mixing, priming, and application instructions.
   4. Shop Drawings:
      a. Patching and Resurfacing Scope Drawings: 1/4-inch scale elevations and plans of areas covered by the Work of this Section.
      b. Reinforcement Shop Drawings: Plans and details showing bar sizes, spacing, locations, depth of doweling, and quantities of reinforcing steel Include schedules and diagrams to indicate beds, sizes and lengths of reinforcing members.

1.5 QUALITY ASSURANCE
A. General: Notify the Owner’s Project Manager and the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of materials.
C. Qualifications:
   1. Materials Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 3 years’ experience.
   2. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.
D. Perform work to provide homogeneous concrete with required strength, durability, and without planes of weakness, and other structural defects, and free of air pockets, voids, projections, off sets of plane, and other defacements on exposed surfaces.
E. Mixing and application equipment as approved by the manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
   1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Owner’s Project Manager and the Architect.
B. Deliver materials in manufacturer's original undamaged packages or acceptable bulk containers.
C. Storage and Handling Requirements:
   1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
   2. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
D. Damaged Material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or show other
evidence of damage, unless the Owner’s Project Manager and the Architect specifically authorizes correction thereof and usage on project.

1.7 ENVIRONMENTAL CONDITIONS
A. Do not place cementitious underlayment when ambient temperature is below freezing.
B. When air temperature has fallen or is expected to fall below 40 degrees F (4 degrees C), heat water and aggregates before mixing to attain concrete at point of placement with temperature of 50 degrees F, 80 degrees F maximum.
C. Do not place concrete underlayment on surfaces that are covered with standing water, snow, or ice.

PART 2 - PRODUCTS
2.1 DESCRIPTION
A. General Description: Interior Work consisting of:
   1. Cement and polymer-based, trowel applied underlayment and patching mortar, for conditions:
      a. Feather to 1/2 inch thick.
      b. 1/2 to 3 inches thick.

2.2 MANUFACTURERS
A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
   1. Ardex Engineered Cements, Aliquippa PA.
   2. H.B. Fuller Construction Products, Inc., ProSpec, Aurora, IL.
   3. Silpro Corporation, Ayer MA.

2.3 UNDERLAYMENT AND PATCHING MORTAR
A. General: Provide products that are compatible with flooring adhesives.
B. Concrete Resurfacing and Underlayment: For applications up to 1/2 inch thick; factory blended Portland cement based product mixed with latex admixture, having the following performance characteristics:
   1. Thickness Range: From feather edge to 1/2” maximum thickness.
   2. Working Time: At least 30 minutes at 70°F.
   3. Compressive Strength: ASTM C109, minimum 4,200 psi after 28 days.
   4. Tensile Strength: ASTM C190, minimum 1,040 psi after 28 days.
   5. Flexural Strength: ASTM C348, 1,560 psi after 28 days.
   6. Shear Bond Strength: ASTM C1042, minimum 1,540 psi after 28 days.
   7. Bond Strength to Concrete: ASTM C321, Crossed brick method, failure in concrete
   8. Acceptable Products:
      a. Ardex: “Feather Finish”.
      b. ProSpec: “Feather Edge”.
      c. Silpro: “Masco Underlayment and Repair Mortar with Silpro C21”.
C. Concrete Resurfacing and Underlayment: For applications over 1/2 inch thick and up to 3 inches thick; factory blended Portland cement based product with latex admixture, having the following performance characteristics:
   1. Thickness Range: From 1/2 inch to 3 inch maximum thickness. Provide without added aggregate, unless recommended by manufacturer for thickness required.
      b. Ardex: 1/2 inch to 2 inches without aggregate; Use 3/8 pea stone for 2 to 3 inch thickness.
c. Bonsal (Pro Spec): 1/2 inch to 2 inches without aggregate; Use 3/8 pea stone for 2 to 3 inch thickness.
2. Working Time: At least 30 minutes at 70°F.
3. Compressive Strength: ASTM C109, minimum 6,000 psi after 28 days.
4. Tensile Strength: ASTM C190, minimum 710 psi after 28 days.
5. Flexural Strength: ASTM C348, minimum 1,200 psi after 28 days.
6. Shear Bond Strength: ASTM C1042, minimum 1,540 psi after 28 days.
7. Acceptable Products:
   a. Ardex: “SD-T”.
   b. ProSpec: “Premium Patch 100”.
   c. Silpro: “Mascrete Topping and Structural Repair Mortar with Silpro C21”.

D. Primers: Unless otherwise recommended by underlayment and patching mortar manufacturer for substrate material, condition, and porosity encountered:
1. Ardex: “P-51”.
2. ProSpec: “Level Set Primer”.
3. Silpro: “C-21 All Acrylic”.

2.4 CONCRETE FILL MATERIALS AND RELATED COMPONENTS

A. Concrete Materials for Slab Infill Construction:
1. Cement conforming to ASTM C150, Type II - Normal.
2. Fine aggregates conforming to ASTM C33; natural sand.
3. Course aggregates conforming to ASTM C33; crushed stone or gravel.
5. Minimum Compressive Strength: 4000 psi at 28 days, for slabs on grade, and topping slabs on metal deck, unless otherwise indicated on the Drawings.
6. Maximum Water to Cement Ratio: 0.45.
7. Concrete Bonding Agent: Two component epoxy bonding agent conforming with ASTM C881, Type 2.
8. Entrapped Air: 2.5% +/- 1% (entrapped air only, no entrainment).

B. Reinforcing Materials for Slab Infill Construction:
1. Reinforcing Bars: ASTM A615, Grade 60
3. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use plastic, wire bar type supports or concrete block supports complying with CRSI recommendations, unless otherwise specified. Wood, clay brick and other unspecified devices are not acceptable.

C. Doweling Materials: For joining new concrete infill to existing slab:
1. Reinforcing Bars: ASTM A615, Grade 60, deformed, 3/4 inch diameter, or stainless steel internally threaded concrete inserts, equal to Hilti Concrete Inserts.
3. Equipment for Doweling: Mixing nozzles, nozzle extensions, hole cleaning brush, and applicator, equal to Hilti Epoxy Applicator Gun.

D. Under-Slab Vapor Barriers: For slab infill construction:
1. Sheet Membrane Vapor Barriers (Vapor Retarders): Under concrete slabs-on-grade:
   a. Specified Product (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on Stego Industries LLC company, Product: “Stego Wrap (15 mil)”.  
   b. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, products which may be incorporated in the work include, but are not limited to, the following:
1) Stego Industries LLC, San Juan Capistrano, CA, product: “Stego Wrap (15 mil)”.  
2) W.R. Meadows, Hampshire, IL, product: “No. 723 Perminator (15 mil)”.  
3) Reef Industries, Houston, TX, product “Griffolyn -15 Mil Green”.  
4) Insulation Solutions Inc., East Peoria IL, product “Viper II, 15 mil vapor barrier”.

c. Characteristics:  
1) Minimum thickness: 15 mils.  
2) Permeance complying with ACI 302.2R.  
3) Permeance after conditioning when tested in accordance with ASTM E1745  
   (where applicable): Less than 0.01 perms (gr/ft²/hr/in-Hg).  
4) Water vapor barrier tested by ASTM E1745: Meets or exceeds Class A.

d. Installation: Below-slab vapor barriers/retarders:  
1) General: Install Vapor Barrier in accordance with manufacturer’s instructions  
   and ASTM E1643. Place vapor barrier beneath all floor slabs.  
2) Seal with manufacturer’s tape.  
3) Seal all penetrations (including pipes, reinforcing steel, and permanent utilities)  
   with manufacturer’s pipe boot or vapor barriers recommended detail.  
4) Do not puncture vapor barrier. No punctures or unsealed penetrations are  
   permitted.  
5) Repair damaged areas by cutting patches of vapor barrier, overlapping  
   damaged area 6 inches and taping all four sides with tape.

E. Base Materials: For slab infill construction:  
1. Gravel Base: Uniformly-graded mixture of crushed stone, or crushed gravel and  
   uncrushed gravel; free of organic and vegetable matter, wood, brick, debris, trash, frozen  
   materials, and any other materials which are deemed to be unacceptable by the Architect,  
   graded in accordance with ASTM C136

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<tr>
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<tr>
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<td>40 to 65</td>
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<tr>
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<td>20 to 45</td>
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<tr>
<td>No. 8</td>
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<tr>
<td>No. 50</td>
<td>4 to 15</td>
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<tr>
<td>No. 200</td>
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</table>

F. Fill Material: For crushed stone base course for slab infill construction:  
1. Inert material of hard durable stone, sand and silt that is free from clay, friable materials  
   and debris; graded in accordance with AASHTO T11 and T27 with the following limits.

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<td>20 to 45 percent</td>
</tr>
<tr>
<td>No. 200</td>
<td>15 to 30 percent</td>
</tr>
</tbody>
</table>

2. Base Course Installation:  
   a. Aggregate shall be applied in lifts less than or equal to 6 inches thick, compacted  
      measure. Each lift shall be compacted to specified density.  
      1) Material shall be placed adjacent to wall, manhole, catch basin, and other  
         structures only after they have been set to required grade and level.
2) Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

3) Surface irregularities which exceed 1/2-inch as measured by means of a 10 foot long straightedge, shall be replaced and properly re-compacted.

2.5 ACCESSORIES:
   A. Water: Clean and potable.
   B. Cleaning Agent: Commercial Muriatic acid.
   C. Perimeter Joint Filler: Glass fiber strips, compressible to 50 percent original thickness under load of 25 pounds per square inch with full recovery. Conforming to ASTM C612, Class 2.

2.6 SOURCE QUALITY CONTROL
   A. Manufacturer Services: Make arrangements to have Manufacturer’s representative (employed by manufacturer) on-site during Work of this Section to periodically review installation procedures. A minimum of 3 site visits are required.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Beginning of installation means acceptance of existing conditions.

   B. The contractor shall inspect and sound the areas involved to determine the full extent of the work involved and shall outline the limits of work involved using a marking crayon, paint or other suitable method for review by the Owner’s Project Manager and the Architect.

3.2 PREPARATION - GENERAL
   A. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using acid; rinse surface with clean water and allow to dry.

   B. Remove loose and friable materials from depressions and edges so new material bonds to sound existing construction.

   C. Flush out cracks and voids with Muriatic acid to remove laitance and dirt. Chemically neutralize by rinsing with water.

   D. Apply recommended number of coats of specified primer, at strength recommended for the substrate, by the primer manufacturer.

   E. Preparation for Patching Holes and Depressions:
      1. Edges: Confirm edges are saw cut. Broken and fractured edges are not acceptable.
      2. Shape for Slabs-on-Grade: Confirm excavated shape has a greater surface area at the bottom than at the top to create a "dovetail slot" where the new concrete fill is mechanically locked.
      3. Shape for Supported Slabs: Confirm sound support and formwork at limits of placement.

   F. Where concrete patching, filling, or topping is required to "feather edge", saw cut a minimum 3/4 inch wide by 3/8 inch deep bonding channel in the concrete substrate at the point of feather edging.

3.3 RESURFACING WORK - GENERAL
   A. For spalling slab areas, saw-cut around spalled areas to a depth of 1/2 to 3/4 inch. Angle bottom of saw cut away from spalled areas to provide keying. Chip out spalled area to saw cuts, chip area flat and level. Fill voids flush with surface with underlayment patching material.

   B. In locations where concrete is loose, chipped, or missing to a depth of more than 3 inches, dowel stainless steel reinforcing into existing concrete. Drill holes in existing concrete equal to depth of repair; insert 1/4-inch diameter stainless steel dowels and pack solid with high-strength non-shrink grout.
FILLING WITH CONCRETE

A. Install all framing, formwork and dowels required for the placing of concrete and for bonding new concrete to existing.
   1. Installation:
      a. Drill 5/8-inch diameter holes six inches deep into the existing concrete slab, placed 12 inches on center horizontally or vertically, depending upon the predominant orientation of the joint. If the joint is wider than it is tall, place the holes horizontally. If the joint is taller than wide, place the holes vertically. Keep the holes at least six inches in from any edges, to avoid breaking chips from the existing concrete.
      b. Flush the holes with water. When dry fill with epoxy.
      c. Insert 12-inch lengths of rebar into the holes, twisting them to ensure an even coating of epoxy around their circumferences and along their lengths within the holes.
      d. Push duct tape over the ends of the rebar, putting holes in the pieces of tape, and slide them against the holes in the concrete to prevent the epoxy from dripping out while curing.
      e. Paint the portion of the rebar extending from the holes with a metal primer.
      f. Pour the new concrete so it flows around the rebar pins.
   B. Shortly before placing concrete, saturate the perimeter edges of the openings with water. After the free or glistening water disappears, the edges shall be given a thorough coating of neat cement slurry mixed to the consistency of thick paste and scrubbed in with a stiff bristle brush.
   C. Place mix and strike level with adjacent surfaces.
   D. Texture of finished concrete shall match that of existing abutting concrete.

APPLICATION - CONCRETE UNDERLAYMENT AND PATCHING MORTAR

A. Surface Preparation:
   1. Clean substrate free of grease, wax, curing compounds and all other foreign materials. Substrates shall be solid and sound; remove all soft or crumbly materials.
   2. Make adhesion tests as recommended by manufacturer to ensure good bond to substrate. Acid etch polished floors. Completely strip sealed floors of existing sealer compounds.
   3. Prime subfloors as recommended by underlayment manufacturer, using the correct primer for porous and non-porous subfloors.
   B. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
   C. Mix product directly from sealed package with water in proportions recommended by manufacturer. Where recommended by product manufacturer, add crushed stone aggregate and blend to dry mix prior to adding latex admixture. Avoid over watering.
   D. Apply underlayment and patching mortar while primer is still tacky. Place and trowel underlayment to the desired thickness. Do not use a power trowel. Steel trowel finish where underlayment will be a substrate for a finished flooring surface.
   E. If two or more layers of underlayment are applied, place second layer after first layer has set to walkable hardness.
   F. Where depressions occur, fill depressed area level with abutting surfaces.
   G. Install expansion joint filler at:
      1. Perimeter of placements.
      2. Around penetrations through decks.

TOLERANCES

A. Installation Tolerances: The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Document and shall not be added to allowable tolerances indicated for other work.
1. Allowable Variation from True Level: 1/8" in 10'-0" when measured with a 10 foot long straight edge in all directions.

3.7 DEFECTIVE UNDERLAYMENT

A. Defective underlayment and patching mortar: Defined as material not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Refinish or remove and replace underlayment and patching mortar surfaces that are too rough to receive finish flooring or where physical properties do not meet specified requirements.

C. Repair or replacement of defective underlayment will be determined by the Owner’s Representative and the Architect.

END OF SECTION
SECTION 055000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The work of this Section consists of miscellaneous metals, and ornamental iron where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.

B. Furnish and Install:
   1. Bollards.
   2. Soffit support framing.
   3. Above ceiling supports for equipment and other similar products furnished under other sections.
   4. Universal grid system.
   5. All other non-specified metal work generally performed by the miscellaneous metals trade, and which are not otherwise provided under the structural documents.

C. Furnish the following items for installation under related sections:
   1. Anchors, bolts, inserts, and sleeves, required to attach miscellaneous metals for embedment into concrete under Section 033000 - Cast-In-Place Concrete.

D. Perform all drilling and cutting in miscellaneous metal items required for the attachment of other items.

E. Remove hardware and fittings from existing metal framing, and patch with metal paste filler.

F. Perform all shop-painting for all surfaces of exposed to view galvanized and non-galvanized metals, and post-erection touch-up of shop prime coat, using the same material as shop-prime coating.

G. Perform application of liquid zinc touch-up to all welds of galvanized steel items furnished hereunder.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - Product Requirements: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - Construction Waste Management and Disposal: Procedural and administrative requirements for construction and demolition recycling.

D. Section 064000 - Architectural Woodwork: Countertops requiring fabricated steel supports.

E. Section 092216 - Non-Structural Metal Framing: Non-loadbearing metal framing systems for interior partitions and ceilings.

F. Section 061000 - Rough Carpentry: Wood blocking.

G. Section 099100 - Painting: Applied finish coatings other than those specified herein.

1.3 REFERENCES

A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.

1. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
2. ASME B18.6.3 - Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).
11. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
17. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
20. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
26. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength.
27. AWS - Standard Code for Arc and Gas Welding in Building Construction.
29. MIL-P-21035B - Paint High Zinc Dust Content, Galvanizing Repair (Metric) (superseding DOD-P-21035A)
30. SSPC Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").
31. SSPC Paint 29 - Zinc Dust Sacrificial Primer, Performance-Based.
32. SSPC SP 1 - Solvent Cleaning.
33. SSPC SP 2 - Hand Tool Cleaning.
34. SSPC SP 3 - Power Tool Cleaning.
36. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate work of this Subcontract with that of other trades affecting or affected by this work, and cooperate with the other trades as necessary to assure the steady progress of work.
   a. Make arrangements for delivery, receipt and installation of inserts and anchorages with the respective trades responsible for installing inserts and anchorages furnished by this Section to prevent delay of the Work.
2. Be responsible for establishing locations and levels for all work of this Section, except such parts as may be delivered to others and set by them. In such cases assist them in properly locating said parts.

B. Pre-Installation Meetings: At least two weeks prior to commencing fabrication work of this Section, conduct a pre-installation conference at the Project site. Comply with requirements of Section 013000 - Administrative Requirements. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
1. Required Attendees: Owner’s Project Manager, Architect, Contractor, Installer’s Project Superintendent, and representatives of other related trades as directed by the Owner’s Project Manager, Architect or Contractor.
2. Agenda:
   a. Scheduling of metal fabrications operations.
   b. Review of staging and material storage locations.
   c. Coordination of work by other trades.
   d. Installation procedures for ancillary equipment.
   e. Protection of completed Work.

C. Sequencing:
1. Field Measurements:
   a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
   b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 013000 - Administrative Requirements:
1. Product Data: Manufacturer’s complete product data and specifications for all prefabricated items, shop primer paints, liquid zinc coating, and hydraulic cements, to be furnished hereunder.
   a. For epoxy anchoring systems: Furnish ICC-ES Code approvals and performance data that includes recommended loading for each application.

B. Shop Drawings:
1. Shop Drawings, bearing registration stamp of a Professional Structural Engineer registered in the state in which the project is located.
   a. General Requirements:
1) Include large scale details of items of all metal fabrications to be furnished hereunder, showing proposed methods of anchorage to surrounding structure and conditions.

2) Indicate on the shop drawings all erection marks for various places of miscellaneous metals, and ensure that the actual field pieces bear corresponding marks.

3) Indicate shop built components, and field-built components.

4) Indicate and detail all field installation connections.

5) Indicate weld types and length.

6) Indicate blocking locations.

7) Indicate seam locations in high-strength steel members

2. Include large scale details of metal fabrications supporting work of other trades.

3. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

4. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

5. Selection Samples:
   a. Sample card indicating Manufacturer's full range of colors of shop applied finishes available for selection by the Architect.

C. Certificates:

   1. Certificate of Compliance from Galvanizer: Submit notarized Certificate of Compliance with application for payment for galvanizing, signed by galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.

   2. Welders certificates as specified under Article entitled “QUALITY ASSURANCE”.

D. Delegated Design Submittals: Provide calculations for loading and stresses for the work of this section, bearing the Professional Structural Engineer’s seal. Show how design load requirements and other performance requirements have been satisfied as required by the applicable building codes.

   1. Work scope requiring loading and stress calculations includes, but is not limited to the following:
      a. Metal fabrications supporting work of other trades.
      b. Mechanical equipment platforms.
      c. Overhead supports.

E. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

1.6 QUALITY ASSURANCE

A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

   1. Galvanizer’s Tagging: The galvanizer shall mark all lots of material with a clearly visible stamp or tag indicating the name of the galvanizer, the weight of the zinc coating, and the applicable ASTM Specification Numbers.

B. Qualifications:

   1. Fabricator/Installer: Minimum of 5 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.

   2. Welders: Utilize only qualified welders employed on the Work. Submit verification that Welder’s are AWS D1.1 and D1.4 qualified within the previous 12 months.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
1. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Subcontract, have been received and approved by the Architect.

B. Storage and Handling Requirements:
   1. Handle and store materials under cover in a manner to prevent defacement, deformation, or other damage to the materials and to shop finishes, and to prevent the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. General: All materials shall be new stock, free from defects impairing strength, durability or appearance, and of best commercial quality for each intended purpose. Unless specifically called for otherwise, work shall be fabricated from the following:
      1. Steel Shapes, Plates and Bars: ASTM Designation A36.
      2. Steel Pipe: ASTM A53, grade A, seamless pipe, black finish unless otherwise noted.
      4. Structural Steel Tubing: Square and rectangular shapes, ASTM A500, Grade B.
      5. Stainless Steel Tubing: ASTM A554, Grade MT304.
      7. Steel Plates: To be bent or cold-formed, ASTM A283, grade C.
     10. Galvanized Carbon Steel Sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A653/A653M.
     11. Stainless Steel Plate and Sheet: ASTM A666, Type 304.
   B. Recycled Content of Ferrous Metals: Use maximum available percentage of recycled steel. Steel incorporated into the work shall contain not less than 25 percent of recycled steel.
   C. Steel Materials to be Hot Dip-Galvanized: Provide steel chemically suitable for metal coatings complying with the following requirements: Carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.
   D. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

2.2 UNIVERSAL GRID SYSTEM
   A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Unistrut Corporation, Itasca, IL.
      1. Acceptable Manufacturers and Products: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following.
         a. Unistrut Corporation, Itasca IL., product “Unistrut”
         b. Cooper US, Inc., Houston TX., product “Cooper B-Line”.
         c. Gleason Partners, LLC., Grand Rapids, MI., product “Strut Channel Systems”.
         d. Thomas & Betts Corporation, Memphis TN, product “Kindorf Superstrut”.

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2. There are no other manufacturers of this product type available in the United States, fabricators may choose to fabricate grid system components using structural steel shapes, with submittal and approval of complete engineering Drawings and calculations as a substitution.


B. All channel members shall be fabricated from structural grade steel confirming to the following ASTM specifications:
   1. ASTM A653 Grade A

C. All fittings shall be fabricated from steel conforming to one of the following ASTM specifications:
   1. ASTM A36, A575, or A576.

D. All materials shall be stamped and identifiable by manufacturer and part number (where appropriate). Materials that appear damaged, distressed, unidentifiable or rusted shall not be used and will not be accepted.

2.3 FASTENERS

A. General: Provide all fasteners and attachments as required for work specified herein and as indicated on the Drawings.
   1. In general,
      a. Provide all fasteners and attachments of the same material and finish as the metal to which it is applied unless otherwise noted.
         1) Provide Type 304 stainless-steel fasteners for exterior use.
         2) Provide Type 304 stainless-steel fasteners for fastening aluminum.


C. Fasteners at Blind Structural Tubes, or other Blind Conditions: Lindaptor North America, Ann Arbor MI, product: “Type HB Hollo-Bolt”, or approved equal.
   1. Acceptable Manufacturers, or approved equal.
      a. Lindaptor North America, Ann Arbor, MI.
      b. Simplified Building Components, Rochester, NY.
      c. Avdel USA LLC., Stanfield, NC.
   2. Head type: Hexagonal.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel type 304 bolts, nuts and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36.
   1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A489.

G. Machine Screws: ASME B18.6.3.


2.4 ACCESSORIES

A. Adhesive for Attaching Anchors and for Direct Pinning: High-modulus, high strength, moisture tolerant, epoxy adhesive, two-component 100 percent solids, epoxy resin complying with ASTM C881.
   1. Minimum performance properties (as cured at 70 degrees F. and 50 percent relative humidity):
a. Minimum Compressive Strength, as tested per ASTM D695:
   1) At 3 days: 11,300 psi (31.0 MPa).
   2) At 7 days: 11,800 psi (44.8 MPa).
   3) At 28 days: 12,200 psi (58.6 MPa).

b. Shear Strength: 6200 psi (43 MPa) at 14 days, as tested per ASTM D732.

c. Minimum Flexural Strength: 10,700 psi (74 MPa) at 14 days, as tested per ASTM D790.

d. Minimum Bond Strength: At 14 days, as tested per ASTM C882:
   1) Plastic Concrete to Hardened Concrete: 2200 psi (13.8 Mpa).
   2) Plastic Concrete to Steel: 2000 psi (13.8 Mpa).

e. Maximum Water Absorption: 24 hour 0.27%, as tested per ASTM D570.

f. Minimum Tensile Properties: Tensile Strength 6900 psi (48 Mpa), as tested per ASTM D638.

2. Products which may be considered as equal include the following, or approved equal:
   a. Sika Corporation, Lyndhurst NJ., product: “Sikadur 32 Hi-Mod Gel.”
   b. Simpson Strong Tie, Pleasanton, CA., product “SET High Strength Epoxy”.
   c. Symons Corporation, Des Plaines, IL., product “Rescon Gel anchor 304”.

B. Grout: Ready mixed, non-metallic high-strength controlled expansion grout of flowable consistency, conforming to ASTM C1107 with minimum compressive strength of 8,000 pounds per square inch (55.2 MPa) at 28 days.
   1. Products which may be considered as equal include the following, or approved equal:
      b. L&M Construction Chemicals, Omaha NE, Product: “Crystex.”
      c. BASF Construction Chemicals, Cleveland, OH., product “Masterflow 713”.
      d. Sika Corporation, Lyndhurst, NJ., product “SikaGrout 212”.
      e. ChemMasters, Madison, OH., product “Conset”.

C. Metal Paste Filler: 2 component epoxy, high strength, structural adhesive putty:
   1. Products which may be considered as equal include the following, or approved equal:

D. Liquid Zinc Coating: For touch-up of welds, scratches, and abrasions in galvanized steel:
   1. Low VOC organic zinc-rich coating containing 92% metallic zinc, by weight in the dried film (ASTM D520, Type III) and conforming to SSPC Paint 20, Type II, Level 1. Liquid zinc coating shall be recognized under the Component Program of Underwriter’s Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to MIL-P-21035B and SSPC Paint 29, Type II, Level I, for repair of hot-dip galvanizing and meeting the requirements for Zinc-Rich Paints.
      a. VOC limit: not more than 250 g/L.
      b. Specified manufacturer and product: ZRC Worldwide, Marshfield MA, product “ZRC-221”.

E. Primer for Non-Galvanized Steel Surfaces:
   1. Modified alkyd rust-inhibitive, high solids primer.
   2. Products which may be considered as equal include the following, or approved equal:
      a. International (Courtaulds Coatings): Interlac 260HS.
      b. Rust-Oleum: 1069 Heavy Duty Rust Inhibitive Red Primer.
      d. Tnemec: 10-99 Red Primer.
      e. Wibur & Williams (California Products Corporation): 1703 Universal Metal Primer.
2.5 FABRICATION - GENERAL

A. Metal surfaces shall be clean and free from mill scale, flake, rust and rust pitting; well formed and finished to shape and size, true to details with straight, sharp lines, and angles and smooth surfaces. Curved work shall be to true radii. Exposed sheared edges shall be eased.

B. Shop fabricate items wherever practicable, accurately fitting all parts and making all joints tight. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.

C. Do all cutting, punching, drilling, and tapping required for attachment of anchor bolts and other hardware and for attachment of work by other trades. All such work shall be done prior to hot-dip galvanizing of the various components.

D. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing and/or shop priming.

E. Grind all exposed-to-view welds completely smooth and flush to the surface plane of the base metals. Perform welding work prior to galvanizing in all cases, except where field welding is necessary, in which case, completely coat all such welds with two coats of specified liquid zinc coating, after performing grinding operations.

F. Use screws and bolts only where welding cannot be performed, of sufficient size to ensure against loosening from normal usage of miscellaneous metal items furnished hereunder.
   1. Countersink all screw heads and bolt heads as far as practicable. Use not less than two screw, bolts, or other anchorage items, at each connection point.
   2. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water.

G. Provision for Thermal Movement: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Design, fabricate and install for temperature change range of 120 degrees F, ambient temperature and 180 degrees F, material surfaces.

H. Carefully coordinate the installation of metal fabrications with the work of trades responsible for the installation of interfacing work, and for the installation of work into the various assemblies furnished hereunder, and permit the installation of the related materials to be made at the appropriate times.

I. Fit and assemble metal fabrications in largest practical sections for delivery to site, ready for installation.
   1. Galvanized assemblies: Where size of assembly is too large for galvanizing kettle, galvanize components prior to fabrication and assemble after galvanizing.

2.6 FABRICATION - SUPPORTS

A. Design, engineer and fabricate structural overhead support for equipment, furnishings, and products furnished under Sections, which includes, but is not limited to:
   1. Equipment furnished under individual specification sections.
   2. Medical equipment.
   3. Surgical lights.
   4. Owner’s furnished equipment.
   5. Above ceiling support for intravenous and cubicle curtain track, toilet partitions and similar products furnished under other sections.

B. Fabricate support system to carry the entire load of supported products to building structure above without transferring any horizontal or vertical load to ceiling system(s). Provide frequently spaced holes for multiple adjustment. Provide diagonal bracing. Use of a “Universal Grid” system members is acceptable.
C. Fabricate supports for equipment, fixtures, and appurtenances utilizing a “Universal Grid” system with rails extending wall-to-wall, perpendicular to the path of travel of the same.

1. Design, engineer and fabricate supporting framework to support a concentrated load at any single point along the exposed rails, as exerted by the equipment to be purchased by the Owner.
   a. Installed framework shall have a minimum loading safety factor of 2.5, based upon ultimate strength under static loading conditions.
   b. The concentrated load shall be the maximum that will be encountered by positioning the equipment at the extremities of its travel (maximal load configurations).
   c. Base loads on the most severe conditions as may be encountered by any of the manufacturers producing equipment for the type of services of the rooms indicated.

2. Rail shall be on centers as required by equipment manufacturer and allow continuous attachment along any point on the rail.

3. System shall be true, plumb and level to the tolerances indicated, with no more than 1/720th of the span maximum deflection in either plane, when maximum loading conditions are applied due to equipment operations.

2.7 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 x 2 inches (9 x 50 mm) members spaced at 20 inches (500 mm).
   2. Rungs: one inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
   3. Space rungs 7 inches (175 mm) from wall surface.

2.8 FINISHES - HOT-DIP GALVANIZING

A. Surface preparation prior to galvanizing: Pickle steel prior to galvanizing in conformance with SSPC-SP8. Remove all rust, dirt, weld flux, weld spatter, and other foreign matter.

B. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.
   3. Wherever possible, perform galvanizing after assembly of items.
   4. Galvanized items shall be straightened to remove all warpage and distortion caused by the galvanization process.
   5. Fill vent holes after galvanizing (if applicable), and grind smooth.
   6. Touch-up all breaks on hot-dip surfaces caused by cutting, welding, drilling or undue abrasion with liquid zinc coating as specified herein above. Apply liquid zinc by brush or spray on all damaged areas in two coats to a total dry film thickness of not less than 3 mils. Apply first coat within two hours after damage to hot-dip film to prevent undue oxidation of exposed surface. On all welds remove weld spatter by power wire brushing or equivalent before applying liquid zinc coating. Repair material should extend at least 3 inches beyond all edges of the damaged galvanized area as possible to assure continuity of galvanic protection.
   7. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint, or aluminum paints is not acceptable.

2.9 FINISHES - SHOP APPLIED COATINGS

A. Schedule: Shop applied coatings as scheduled at end of Section and as indicated on Drawings.

B. For Non-Galvanized Steel Surfaces:
1. Surface Preparation Prior to Priming: Thoroughly clean all steel of all loose mill scale by power wire brushing or sandblasting. Remove all rust, dirt, weld flux, weld spatter, and other foreign matter by wire-brushing or scraping (power wire-brushing, if necessary). Grind smooth any sharp projections.

2. Shop apply specified primers thoroughly and evenly on the surfaces and worked into the joints and other open areas on the surfaces. Surfaces inaccessible after assembly shall be given two coats. Dry film thickness of primer shall be not less than 2.4 mils per coat.

C. Hot Rolled Carbon Steel (HRCS): Fabrications and shapes exposed to view (interior only condition):
   1. Glass bead blast all fabrications clean to remove mill scale and other residue ensuring not damage or cutting of metal fabrications. Do not remove black layer of iron oxide from base metal.
   2. Treat cleaned metal with JAX steel blackener and apply two coats of matte Permalac lacquer and one coat of acid base free Renaissance Micro-Crystaline Wax

D. Hot Rolled Steel with Clear Powder Coat Finish:
   1. Preparation: sheets to be cleaned of remaining manufactured residue with ScotchBrite by hand or glass bead blasted (preferred technique), using soft round edge bead type. Do not cut surface with sand blasting techniques.
      a. during cleaning do not remove black layer of iron oxide as harder than base metal.
   2. After cleaning treat with JAX steel blackener.
   3. After blackening coat with 2 coats of matte Permalac lacquer
   4. After applying lacquer apply a coat of Renaissance Micro-Crystaline Wax, free of an acid base. Prohibited is use of Birchwood KC products.
      a. For wax product information, contact: Bauer Fabrication, Eric Bauer 1.802.244.4002

E. Field Touch-Up: Shall be the responsibility of the installing contractor and shall include the filling, and touch-up of exposed job made bolt or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and marks, and final cleaning up of the finished surfaces.
   1. Touch-up finishes shall be fully compatible with, and exactly match shop applied finish, color, texture and sheen.

PART 3 - EXECUTION

3.1 ERECTION - GENERAL

A. General: Accurately set all work to established lines and elevations, and rigidly fasten in place with suitable attachments to the construction of the building. At the completion of the work, check all work, re-adjust as required, and leave in perfect condition. Grind all exposed to view welds smooth to the touch.

B. Setting Bearing and Leveling Plates:
   2. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
      a. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
      b. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

C. Miscellaneous Framing and Supports: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and additional requirements indicated on Shop Drawings.
1. Anchor supports for operable partitions, and similar products, securely to and rigidly braced to building structure.

3.2 FIELD WELDING

A. Field weld components indicated on approved shop drawings in accordance with AWS D1.1. Weld profile, quality, and finish shall be consistent with approved samples and mock-ups.
   1. Welds Ground Smooth: For groove welds, the weld shall be made flush to the surfaces of each side and be within + 1/16", -0" of plate thickness.
   2. Contouring and Blending of Welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up.
   3. Continuous Welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
   4. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.

B. Immediately after welding, touch-up welds, burned areas and damaged surface coatings.
   1. Thoroughly remove all spatter by power wire-brushing (or if inaccessible, wire brushing) per SSPC, surface preparation specification SP 2 or SP 3. Allow surface to cool to ambient temperature. Clean surface with solvent wipe to remove oils, grease and dirt in accordance with SSPC surface preparation specification SP 1.
   2. Apply one coat of liquid zinc to attain a minimum of 1.5 mils dry film thickness. Coating should extend at least two inches beyond either side of weldment to ensure complete coverage of welded area.

3.3 FIELD BOLTING

A. Accurately drive all bolts into holes, protecting the bolt heads so as not to damage the thread during the driving. Ensure that bolt heads and nuts rest squarely against the metal. Where structural members have sloping flange faces, provide approved beveled washers at the bolted connections to afford square seating for bolt heads or nuts. Nick bolt threads for unfinished bolts to prevent the nuts from backing off.
   1. Bolt Head Orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.

B. Use an approved calibrated manual or power torque wrench to obtain the proper torque and tension as recommended by the bolt manufacturer for all ASTM F3125 bolts.

3.4 TOUCH-UP

A. Touch-up all welds, burned areas, scratches, abrasions, on galvanized metals, using specified liquid zinc coating.

B. Touch-up all welds, scratches, abrasions, and other surface damaged on shop-primed or painted metals, using the same coatings as specified under shop applied finishes, herein above.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Fire retardant treated plywood backer panels for mounting of electrical panelboards, telephone/data backboards, HVAC and fire control equipment and other equipment.
   2. Plywood wall sheathing beneath gypsum wallboard partitions, including but limited to the following:
      a. Door frames.
      b. Door stops, (wall mounted).
      d. Products bracketed to walls, (including sinks, cabinets and similar products).
   3. Concealed wood blocking, nailers, and supports.
   4. Various wood blockings, edgings, nailers, curbs, cants, grounds, furring, sheathing, framing members including wood preservative, as required for receipt of various finishes and surfacing materials, not described herein above.
   5. Rough installation hardware, including bolts, screws, spikes, nails, clips, and connection assemblies, as needed for installation of the rough carpentry work.

B. Install the following furnished under the designated Sections:
   1. Metal door frames furnished under Section 081113 - HOLLOW METAL DOORS AND FRAMES.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 092216 - NON-STRUCTURAL METAL FRAMING: Metal framing for drywall construction work.
E. Section 092900 - GYPSUM BOARD: Wallboard construction work, having taped and compounded joint finish.
F. Section 099100 - PAINTING: Applied primer and finish coatings to exposed to view rough carpentry work.
G. Division 26 - ELECTRICAL: Providing and mounting electrical panels and equipment.

1.3 REFERENCE STANDARDS

A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   2. American Lumber Standards Committee, National Lumber Grades Authority for Canadian Lumber, and applicable grading rules and standards of the various lumber associations whose species are being used for grades specified.
   3. APA - applicable grades and specifications.
   6. ANSI A250.11 (formerly SDI 105) - Recommended Erection Instructions for Steel Doors and Frames.
10. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.
12. AWPA Standards and references for preservative treated wood including Standards C15, UC1, UC2, UC3A, UC3B, UC4A, UC4B, UC4C.
13. AWPA M4 - Care Of Preservative Treated Wood Products.
15. MIL L-1914OE - Lumber and Plywood, Fire Retardant Treated.
19. UL - Building Materials Directory
20. US. Department of Commerce Voluntary Product Standard PS1 for Construction and Industrial Plywood.
21. US. Department of Commerce Voluntary Product Standard PS2 for Wood-Based Structural-Use Panels.
23. U.S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. Coordinate the work of this Section with the respective trades responsible for locating anchorages installed into blocking which is provided under this Section.
2. Coordinate work of this Section with the work of the various trades responsible for applying finish materials and other items to rough carpentry work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

1.5 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for products specified herein.
2. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft (1:8).
3. Samples: Submit two samples of wood trim 12 inch (300 mm) long.
4. Certifications:
   a. Written certification from the respective treatment plants indicating types of wood preservative treatment and fire-retardant treatment used, treatments method, applications instructions, and conformance to the requirements specified herein.
      1) Provide certification that fire retardant treatment materials do not contain ammonium phosphate.
      2) Provide report from ICC Evaluation Service on fire retardant treated wood flame spreading, strength, corrosion and hygroscopic properties.
      3) Provide report from ICC Evaluation Service on pressure preservative treated wood strength, corrosion, anti-fungi, and anti-insect properties.
1.6 QUALITY ASSURANCE
   A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
      1. All lumber shall:
         a. Be new, dressed four sides (S4S), clear and free from warping and other defects.
         b. Have a moisture content not exceeding 19 percent when delivered to the project.
         c. Be in accordance with the grading rules of the lumber manufacturer's association under whose jurisdiction the lumber is produced and bear the mark of grade and mill identification.
   B. Certifications:
      1. Plywood: Conform to the requirements of Product Standard PS-1, and bear applicable APA grade trademarks.
         a. Plywood for electrical boards treated for retardance, meet Class I or a flame spread rating of 25 or less and bear U.L. label "Classified FRS".

1.7 DELIVERY, STORAGE, AND HANDLING
   A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
   B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 - PRODUCTS

2.1 BOARD AND SHEET MATERIALS
   A. Lumber for Blocking, Nailers and Curbs: As indicated or required; Hem-Fir, Douglas Fir, Eastern Spruce, Eastern Hemlock, or Southern Pine, surfaced dried stud or utility grade. Wood members shall be of sizes indicated on the Drawings or of the same size as the members being braced.
      1. 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.
      2. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
   B. Plywood and Sheet Products:
      1. For electric panel board mountings and similar uses: APA graded B-D INT, Group 2 species, touch-sanded, fire-retardant treated, 3/4 inch thick, except as otherwise indicated on the Drawings.
      2. For unspecified interior concealed from view locations: APA graded C-D PLUGGED INT, Group 2 species, thickness as indicated on the Drawings.

2.2 WOOD TREATMENTS
   A. All blocking shall be fire retardant type wood except for areas subject to high moisture, such as window and door framing, and as additionally indicated on the Drawings.
   B. Treated wood products shall be produced by a single treatment plant, fully licensed by the chemical manufacturers, and conforming to the requirements specified herein.
      1. Toxicity and Environmental Quality:
         a. Products containing chromium will not be permitted.
         b. Products containing arsenic will not be permitted.
         c. Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.
      2. Dye wood or otherwise color code all treated wood at treatment plant to clearly distinguish the different treatments in the field.
      3. Kiln dry all treated lumber and plywood to the following maximum moisture content after treatment.
a. Lumber: 19 percent.
b. Plywood 15 percent.
c. Discard pieces with defects which might impair quality of work.

4. Quality Marks: Each piece of lumber and plywood shall be permanently affixed with a quality mark, containing the following information:
   a. Identification of the inspection agency.
   b. Standard to which material was treated.
   c. Identification of the treating plant.
   d. Fire retardant treated wood shall include: stamp signifying a FR-S rating
   e. Preservative treated wood shall include: Retention and end use for which product is suitable.

C. Fire Retardant Treated Wood. Designated as “FRTW”:
   1. Manufacturers:
   2. Fire retardant treated wood shall comply with the following requirements:
      a. All fire-retardant lumber and plywood must have an Underwriters Laboratories stamp signifying a FR-S rating certifying a 25 or less flame spread and smoke developed value, when tested in accordance to ASTM E84.
      b. Corrosion Rates: Less than one mil per year for carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire retardant treated wood when tested in accordance with Federal Specification MIL-L-19140E Paragraph 4.6.5.2.
      c. The fire retardant treated wood must have an equilibrium moisture content of not more than 25 percent when tested in accordance with ASTM D3201 procedures at 95 percent relative humidity and 80 degrees Fahrenheit.
      d. Fire Retardant Chemical: Registered for use as a wood preservative by the U.S. Environmental Protection Agency.
      e. Testing: Fire performance and strength properties for both lumber and plywood, of the fire retardant treated wood shall be recognized by issuance of a ICC Evaluation Service Report. Fire retardant chemical must not damage the middle lamella of the wood structure when exposed to 170 degrees Fahrenheit and 90 percent relative humidity for 23 days.
   3. Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include:
      a. Interior Type:
         1) Hoover Treated Wood Products, Inc., product Pyro-Guard.
         2) Koppers Performance Chemicals, Inc., product FirePRO.
         3) Lonza Group, product Dricon.
         4) Viance, LLC, D-Blaze FRTW
      b. Exterior Type:
         1) Hoover Treated Wood Products, Inc., product Exterior Fire-X.
         2) Lonza Group, product FRX.

D. Pressure Preservative Treated Wood. Designated as “PT”:
   1. Manufacturers:
      d. Viance, LLC, Charlotte, NC; Preserve ACQ: www.treatedwood.com/#sle.
2. Treatment: Ammoniacal Copper Quaternary Compound (ACQ), arsenic-free and chromium-free chemical “ACQ Preservative” in accordance with AWPA Standards. Apply the preservative in a closed cylinder by pressure process in accordance with AWPA Standard C15.
   a. Minimum preservative retention for floor plates, framing, lumber and plywood above ground use: 0.25 pounds per cubic foot (4.0 kg/m³) of ACQ chemical, in accordance with AWPA UC1, UC2, UC3A, and UC3B, or NER-643 as appropriate.
   b. Minimum preservative retention for framing, lumber and plywood in contact with water, ground, concrete and masonry: 0.40 pounds per cubic foot (6.4 kg/m³) of ACQ chemical, in accordance with AWPA UC4A, UC4B, UC4C, or NER-643 as appropriate.
   c. Minimum preservative retention for lumber and plywood in permanent wood foundations: 0.60 pounds per cubic foot (9.6 kg/m³) of ACQ chemical, in accordance with AWPA UC4B, or NER-643.

3. Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include:
   b. Lonza Group, product Wolman E.
   d. Viance, LLC, product Preserve ACQ.

4. Fixation of Chemical: Treated wood shall not be shipped from treatment plant until fixation of the preservative has occurred in the wood.

2.3 ACCESSORIES

A. Adhesives:
   1. General: Provide adhesives approved which are Low-VOC or non-VOC, non-flammable, water-proof after cured, odor free.
   2. Adhesive for Lamination and Fabrication of Wood and Plywood Items: Exterior adhesives containing no urea formaldehydes, having a VOC limit of 70 g/L.
   3. Adhesive for Subfloors and Underlayment: High strength, waterproof and non-freezing adhesive complying with AFG-01 “Frozen Lumber Test” and ASTM D3498, and having a VOC limit of 50 g/L.

B. Nails (Interior and Exterior): Galvanized common nails, of size and type to suit application and as required by state and local building codes.

C. Screws:
   1. Screws for Interior Applications: Flat head electroplated-galvanized wood screws of the appropriate sizes.

D. Anchor Bolts, Expansion Bolts and Lag Screws: Hot-dipped galvanized steel, of the following types:
   1. Lumber Having Actual Thickness of 1-1/2 inches or Greater: To masonry and concrete:
      a. Anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, 3/8-inch minimum diameter, spaced as shown on drawings, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
   2. For Lumber Having Actual Thickness of Greater than 7/8-inch but less than 1-1/2 inches: To masonry and concrete:
      a. Anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, at least 1/4-inch diameter of the most appropriate lengths for the specific application, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
   3. For Lumber Having Actual Thickness of 7/8-inch and less: Anchor bolts or expansion bolts, at least 1/4-inch in diameter; or screws, of the most appropriate sizes; in lengths most suitable for the specific application, countersunk, spaced, and staggered.
E. Protection Paper: Canadian red-rosen paper or kraft paper.
F. Building Paper: ASTM D226, Non-perforated, No. 15 (73 kg/sq m) asphalt-saturated building felt.

PART 3 - EXECUTION

3.1 PREPARATION
A. All materials shall be inspected before use, with all checked, split and otherwise deficient stock rejected, or used only for miscellaneous blocking, furring or other incidental use. The Contractor shall be responsible for replacing all lumber which, due to warpage, twist, splitting, or checking, results in unsatisfactory work. Such replacement shall be required at any time, whether before or after application of finish material under other Sections.
B. Verify exact locations of wall mounted railing brackets, door stops, T.V. brackets and similar items with Architect prior to installation of blocking for accessories.

3.2 INSTALLATION - GENERAL
A. Framing Standard: Comply with AWC WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
D. Install shear wall panels to comply with manufacturer's written instructions.
E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
F. Do not splice structural members between supports unless otherwise indicated.
G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
H. Field Cuts of Fire Retardant Treated Lumber: Do not rip or mill fire retardant treated lumber. Only end cuts, drilling holes and joining cuts are permitted.
I. Field Cuts of ACQ Pressure-Treated Lumber: Apply solution of copper naphthenate containing a minimum of 2 percent metallic copper in-solution, in accordance with AWPA standard M4. Brush liberally all cuts and holes.
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 rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   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.

3.3 INSTALLATION - EQUIPMENT BACKBOARDS
A. Provide panel mounting backboards for HVAC, Fire Prevention, Electrical and telephone/data equipment. Fabricate panels using fire-retardant treated 3/4 inch thick panels mounted to fire-retardant treated 2 by 4’s. Provide a nominal space of 3-1/2 inches behind panels to permit wiring.
3.4 INSTALLATION - METAL DOOR FRAMES

A. Place in position all steel frames, furnished under Section 081113 - HOLLOW METAL DOORS and Frames, in accordance with the approved shop drawings and frame schedule. Place, erect and level all frames into correct scheduled locations, including those in masonry partitions.

1. During the installation of metal door frames, after the manufacturer’s steel shipping bars have been removed, install wood spreaders at door opening, carefully dimensioned to permit square and plumb installation of door frames and doors.
   a. Provide rigid temporary bracing for frames as required to ensure maintenance of positioning, and remove only after frames have been permanently anchored.
   b. For doors located in masonry work, maintain frame position with temporary bracing until frames are built-into-place, and grout has sufficiently cured to maintain frame position.
   c. Spreaders shall remain in place until doors are installed.

2. Coordinate installation of frames with the various trades installing abutting wall construction for anchor placement.

B. Coordinate installation of frames with installation of hardware under Section 062000 - FINISH CARPENTRY and as furnished under Section 087100 - DOOR HARDWARE.

C. Install frames in accordance with the manufacturer's recommendations, ANSI/SDI-100, ANSI A250.11 (formerly SDI 105), and the Door Hardware Institute (DHI) recommendations.

1. Secure frames with the following number of anchors per jamb.
   a. For frames 7'-6" in height or less: 3 anchors per jamb.
   b. For frames 7'-6" in height or less and having doors exceeding 3'-0" feet width, and for cross corridor frames: 4 anchors per jamb.
   c. For frames greater than 7'-6", up to 10'-0" in height: 4 anchors per jamb.
   d. For frames greater than 7'-6", up to 10'-0" in height, and having doors exceeding 3'-0" feet width, and for cross corridor frames: 5 anchors per jamb.
   e. For frames over 10'-0' in height: 5 anchors per jamb.

2. Where exposed fastener heads occur in frames, fill with automotive body filler and sand smooth.

3.5 TOLERANCES

A. Door Frames: Maximum diagonal distortion 1/16 inch measured with straight edge, corner to corner.

3.6 CLEANING

A. Daily clean work areas by sweeping and disposing of scraps and sawdust.

B. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.

3.7 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 rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION
SECTION 062000
FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Finish carpentry items including:
   1. Interior trim and hardwood nosing to receive transparent field finishing.
   2. Selving hardware.

B. Install the following furnished under the designated Sections:
   1. Plastic laminated shelves (for wall mounted adjustable shelving) furnished by Section 064000 - Architectural Woodwork.
   2. Steel doors furnished by Section 081113 - HOLLOW METAL DOORS AND FRAMES.
   3. Wood doors furnished by Section 081416 - FLUSH WOOD DOORS.
   4. Door hardware, thresholds, weatherstripping, seals and gaskets furnished by Section 087100 - DOORS, FRAMES AND HARDWARE SCHEDULE.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 064000 - ARCHITECTURAL WOODWORK:
   1. Furnishing and installing cabinetry, plastic laminated shelving, and other built-in-place furniture.
   2. Plastic laminated countertops.

1.3 SUBMITTALS

A. Product Data: For each product specified.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories, two to a minimum scale of 1-1/2 inch to 1 ft (1:8).

C. Samples: Submit two samples of wood trim 12 inch (300 mm) long.
   1. Composite Wood and Agrifiber Products: Written documentation certifying that all composite wood and agrifiber products used on this Project contain no added urea-formaldehyde resins.
      a. Written certification indicating, that only "no added urea-formaldehyde" manufactured composite panel products are incorporated into the Work, including all concealed components. Composite panel products include but are not limited to particle board (PB), Medium Density Fiberboard (MDF), wheatboard and strawboard and similar manufactured products.
      b. Written certification indicating that laminating adhesives used in product fabrication on or off site do not contain any added urea-formaldehyde resins.

1.4 QUALITY ASSURANCE

A. Grade materials in accordance with the following:

B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
1.5 DELIVERY, STORAGE, AND HANDLING
   A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
   B. Protect work from moisture damage.

PART 2 - PRODUCTS
2.1 FINISH CARPENTRY ITEMS
   A. Quality Grade: Unless otherwise indicated, provide products specified by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Architectural Woodwork Standards for Premium Grade.
   B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

2.2 WOOD-BASED COMPONENTS
   A. Wood for interior use shall have a moisture content between 5 and 10 percent, when delivered to the project.

2.3 INTERIOR EXPOSED SOLID WOOD
   A. Interior Exposed Painted Trim: Custom grade poplar, kiln dried (KD).
   B. Interior trim furnished under this Section, scheduled to receive transparent finish: Select White Maple, AWI Premium Grade (as installed), shall be stained to match PL-1A.

2.4 SHELVING HARDWARE
   A. Metal closet rods and brackets.
      1. Closet Rod: 0.06 inch (1.5 mm) wall thickness steel tubing, 1-5/16 inch diameter, of custom cut lengths for full width of closet, chrome finish.
      2. Provide pole sockets for end support and intermediate support brackets for span lengths greater than 48 inches, material and finish to match closet rod.
         a. Provide combination shelf and rod bracket where both shelf and closet rod are indicated.
   B. Adjustable shelving, wall mounted standards and brackets.
      1. Acceptable manufacturers, include the following, or approved equal:
         a. Knape & Vogt, Grand Rapids MI.
         c. Reeve Store Equipment Company (ReeveCo), Pico Rivera CA.
      2. Standards (uprights): Double-slotted channel standards for brackets adjustable in 1 inch (25 mm) increments along entire length of standard, drilled and countersunk for screws. 16 gage, in epoxy powder-coat finish, color as selected by Architect from manufacturer’s full range of colors.
         a. Load Capacity: Recommended by manufacturer for loading of 300 to 680 pounds (135 to 310 kg) per pair of standards.
         b. Locate uprights no greater than 24 inches on center.
      3. Brackets: Double tab type, locking into slots; size to suit shelves; same finish as standards.
         a. Depth: As indicated on Drawings.
         b. Gage:
            1) 16 gage for 8 inch through 12 inch brackets.
            2) 14 gage for 14 inch through 24 inch brackets.
         c. Bracket Quantity: Provide one bracket for each 12 inches (305 mm) of standard length.
      4. Basis of Design:
         a. Adjustable wall mounted rail to be KV#82 ALM 39” STD.
         b. Adjustable brackets to be KV#182 ALM 10.5
2.5 FASTENINGS
   A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
   B. All fasteners to be concealed from view in final installation.
   C. Concealed Joint Fasteners: Threaded steel.
   D. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
   E. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

2.6 ACCESSORIES
   A. Primer: Alkyd primer sealer.
   B. Wood Filler: Solvent base, tinted to match surface finish color.
   C. Moldings and Trim: Type 304 stainless steel, sizes and profiles as indicated.

2.7 FABRICATION
   A. Shop assemble work for delivery to site, permitting passage through building openings.
   B. Fit exposed sheet material edges with 3/8 inch (9 mm) matching hardwood edging. Use one piece for full length only.
   C. Shop prepare and identify components for book match grain matching during site erection.
   D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.8 SHOP FINISHING
   A. Shop finish woodwork items where practical, otherwise prep for site finishing.
   B. Apply wood filler in exposed nail and screw indentations.
   C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
      1. Transparent and stained finish as specified in Section 099000 – Painting and Coating.
   D. Back prime woodwork items to be field finished, prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify adequacy of backing and support framing.
   B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION
   A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
   B. Set and secure materials and components in place, plumb and level.
   C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.
   D. Install aluminum molding and trim according to manufacturer’s instructions at wood panel and decorative glass locations where indicated.
   E. Mount adjustable shelving standards and closet rod supports to solid backing capable of supporting intended loads.
3.3 INSTALLATION - DOORS AND HARDWARE

A. Install doors in accordance with the manufacturer's recommendations, ANSI/SDI-100, ANSI A250.11, and the Door Hardware Institute recommendations.

B. Install hardware in accordance with manufacturer's instructions and requirements of referenced organizations, and the requirements of Section 087100 - Door Hardware.
   1. Use the templates provided by hardware item manufacturer.
   2. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.
      a. Conform to ANSI 117.1 for positioning requirements for the handicapped.
      b. “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute (DHI.)
      c. WDMA Industry Standard I.S.1.7, “Hardware Locations for Wood Flush Doors”.
   3. Installation of hardware shall comply with NFPA 80 and NFPA 101 requirements
   4. Prefit hardware before finish is applied, remove and reinstall after finish is completed.
      Install hardware so that parts operate smoothly, close tightly and do not rattle.
   5. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

C. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant, forming tight seal between threshold and surface to which set. Securely and permanently anchor thresholds, using countersunk non-ferrous screws to match color of thresholds (stainless steel screws at aluminum thresholds).

D. Tools for maintenance: All special tools packaged with hardware items shall be saved, tagged/identified as to product use, and turned over to the Owner upon completion of the Work.

E. Clean adjacent surfaces soiled by hardware installation.

F. Prior to Final Inspection make final check and adjustment of all hardware, clean operating items as necessary to restore proper function and finish of hardware.

3.4 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 099100.

3.5 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

C. Maximum variation for doors and frames: Maximum diagonal distortion 1/16 inch measured with straight edge, corner to corner.

3.6 ADJUSTING

A. Adjust doors for smooth and balanced movement.

3.7 CLEANING

A. Daily clean work areas by sweeping and disposing of scraps and sawdust.

B. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.

C. Remove protective material from pre-finished surfaces.

3.8 PROTECTION

A. During the operation of finish carpentry, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.
SECTION 064000
ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this Section consists of shop fabricated millwork and architectural woodwork where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.

B. Furnish and install the following:
   1. Plastic laminate casework.
   2. Plastic laminate cabinets.
   3. Plastic laminate divider, filler and end panels.
   4. Plastic laminate countertops.
   5. PVC edging of plastic laminate at edges of doors, drawer fronts, casework fronts, and shelving.
   6. Exposed blocking and blocking concealed by the work of this Section required for the installation of architectural woodwork.
   7. Hardware for work of this Section, including custom fabricated hardware and accessories.

C. Furnish the following products to be installed under the designated Sections:
   1. Plastic laminate shelves (for wall mounted adjustable shelving) for installation under Section 062000 - FINISH CARPENTRY.
   2. Wood trim and wall base having shop-applied transparent finish, for installation by Section 062000 - FINISH CARPENTRY.

D. Make all cut-outs within casework items as required to accommodate sinks, piping, conduit, and other mechanical and electrical work, from templates provided by the respective mechanical and electrical trades.

E. Provide glass shelving and perform shop-glazing of casework, furniture and accessories items fabricated by this Section.

F. No attempt is made in this Section to list all elements of architectural woodwork required on this project or to describe how each element will be installed. It is the responsibility of the Contractor to determine for itself the scope and nature of the work required for a complete installation from the information provided herein and in the Drawings.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 061000 - ROUGH CARPENTRY: Concealed wood blocking and nailers.

E. Section 062000 - FINISH CARPENTRY:
   1. Installation of plastic laminate shelving furnished under this Section 064000.
   2. Installation of wood interior trim and wall base furnished under this Section 064000.

F. Section 066116 - SOLID SURFACE FABRICATIONS: Solid polymer countertops, skirts, backsplash and other trim pieces at locations as indicated on the Drawings.

G. Section 092216 - NON-STRUCTURAL METAL FRAMING: Metal framing for drywall construction work.

H. Section 092900 - GYPSUM BOARD: Wall board construction work, having taped and compounded joint finish.

ARCHITECTURAL WOODWORK
064000 - 1
I. Division 22 - PLUMBING: Plumbing fixtures and piping.

J. Division 26 - ELECTRICAL: Electrical connections for power, lighting, and data.

1.3 REFERENCES

A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   3. AWI Quality Certification Program.
   4. APA Grades and Specifications.
   5. National Lumber Grades Authority, American Lumber Standards, and Grading Rules and Standards of the various lumber associations whose species are being used, with grade-marks for same.
   6. U.S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber; and Product Standard (PS):
      a. PS-1 - Construction and Industrial Plywood Standard.
      c. PS-51-71 - Hardwood Plugged Plywood Standard.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Field Measurements: Where possible the woodwork manufacturer shall take field measurements before preparation of shop drawings and fabrication to ensure proper fitting of Work.
      a. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
   2. Field dimensions which are not controlled by Project conditions: The woodwork manufacturer is responsible for details and dimensions not controlled by Project conditions and shall show on his shop drawings all required field measurements beyond his control.
      a. The Contractor shall acknowledge the woodwork fabricator’s need for accurate field dimensions prior to custom fabrication.
      b. The Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

B. Scheduling:
   1. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
   2. Coordinate schedule of construction, size of access, and route to location of installation to prevent delay of installation due to physical impediments. Any work involving the demolition and reconstruction of partitions, walls, floors, roofing, windows, or doors to place and install the work of this Section shall be performed at no additional cost to the Owner.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer’s product data sheets, specifications, performance data, for each item furnished hereunder, including, but not limited to: Fastenings, adhesives, hardware, and accessories.
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Dana 14 Renovation
Boston, MA

E4H Environments for Health Architecture

March 6, 2020

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2. Shop drawings bearing dimensions of actual measurements taken at the project, include at least the following, which are in addition to shop drawing requirements described in AWI Quality Standards:
   a. 1/4 inch scale elevations and plans of each casework item.
   b. Large scale design details of minimum 1-1/2 inch to 1-foot scale, showing abutting materials, installation conditions, clearances. Show profiles, jointing and fastening methods; details of drawers and doors.
   c. Full size or half-full size sections, showing individual components, profiles and jointing.

3. Selection Samples:
   a. Plastic laminate chips for initial color selection by the Architect.
   b. Chain of PVC edging materials.
   c. Provide additional samples as requested by the Architect for initial selection of material colors and finishes.

4. Verification Samples:
   a. Cabinet hinge with manufacturer’s product literature.
   b. Drawer slide with manufacturer’s product literature.
   c. 12 inch long samples of solid hardwoods illustrating maximum range of color variations and applied transparent shop finish.
   d. 12 by 12 inch samples of plastic laminate (of each color required for project).
   e. 12 inch length samples of plastic edging material (of each color required for project).
   f. One each of all cabinet hardware. (approved cabinet hardware samples will be returned to Contractor and may become part of the Work).

5. Manufacturer’s Instructions: Provide installation instructions and templates for hardware and field applied items.

6. Source Quality Control Submittals: AWI letter of licensing for the project for AWI Quality Certification Program.

B. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

1.6 QUALITY ASSURANCE
   A. Quality Standards: All work performed under this Section shall be as defined in the referenced AWI “Quality Standards” for PREMIUM GRADE, as modified herein by this Specification Section.
   B. Qualifications:
      1. Fabricator/Installer: Work of this section shall be performed by a firm licensed by the AWI Quality Certification Program.
         a. Woodwork fabricator/installer is required to be licensed by AWI as competent to perform the work specified. Certification shall be evidenced through the application of AWI Quality Certification labels and issuance of an AWI letter of licensing for the project. AWI certification labels shall be applied to each item of work.

1.7 MOCK-UPS
   A. Provide mock-up under provisions of Section 014000 - QUALITY REQUIREMENTS.
   B. Mockups: Before fabricating and installing interior architectural woodwork, sub-contractor shall build a mockup to verify selections made under Sample Submittals and to demonstrate hardware operation, aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
      1. Mockup configuration shall be as indicated on the Drawings. If not indicated on the Drawings, mockup shall consist of one entire length of upper cabinets, one entire length of lower drawers/cabinets, and all applicable hardware.
The mockup shall fully demonstrate the proposed range of aesthetic effects, workmanship, and the operation of all hardware, including but not limited to cabinet hinges, drawer slides, and pulls.

2. Obtain Owner and Architect's approval of mockups before starting interior architectural woodwork fabrication.

3. Build mockups in the location as indicated on the Drawings or, if not indicated, as directed by the Architect.

4. Notify Architect seven days in advance of dates and times when mockups will be fabricated and installed.

5. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

7. Demolish and remove mockups when directed.

C. Locate mock-ups where directed and include all surfaces and materials scheduled to receive a field applied finish.

1.8 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
   1. General: The woodwork manufacturer, woodwork installer and the Contractor are jointly responsible to make certain that woodwork is not delivered until the building and storage areas are sufficiently dry so that the woodwork will not be damaged by excessive changes in ambient humidity and relative moisture content.

   2. Concrete, masonry, plaster, tile and marble setting and polishing and other wet work shall be completed and dry before delivery, storage and installation of woodwork items.

   3. Sequence deliveries to avoid delays and to minimize on-site storage.

B. Storage and Handling Requirements:
   1. Ship and handle all materials and fabricated items in a manner which will prevent damage thereto, and store all materials and fabricated items at a dry, elevated, ventilated, and protected interior location.

1.9 SITE CONDITIONS

A. Temperature: Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, and during installation of architectural woodwork; maintain temperature after installation until Owner’s Final Acceptance.

B. Relative Humidity: Maintain a relative humidity between 25 and 55 percent for a minimum period of 5 calendar days before, and during, installation of architectural woodwork: maintain relative humidity after installation until Owner’s Final Acceptance.

PART 2 - PRODUCTS

2.1 WOOD MATERIALS - GENERAL REQUIREMENTS

A. General requirements: New, dressed four sides (S4S), and free from warping and other defects.

B. Panel Products: Composite panel products and plywood shall be “no added urea-formaldehyde”, including all concealed components.

   1. Softwood plywood with each sheet bearing the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade and compliance with APS-1. Plywood shall be a minimum of 5 ply for ½ inch thick and above, and 7 ply for plywood 1-1/4 inch thick or thicker.

      a. Plywood cores for plastic laminate shall be exterior type and species group, with veneer grade “A-C”.

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b. Plywood shelving for painted or stained finish shall be interior type of any species group, with veneer grade “A-B” for stained finish and grade “B-C” for painted finish.

2. Moisture Content:
   a. Solid hardwood(s) scheduled for transparent finish: Moisture content shall not exceed 8 percent when delivered to Project.
   b. Typical (hardwood and softwoods): Moisture content of wood shall be between 5 and 10 percent when delivered to the project.

C. Wood Species for WD as indicated on the Drawings:
   1. Exposed wood scheduled for transparent finish, meeting AWI Premium Grade Standards (as installed): Select White Maple (Acer saccharum) sapwood, Plain Sliced.
      a. Wood shall color match specified veneer, and be clear without knots, and other natural defects.

D. Concealed supports for edge and corner backing shall be kiln dried birch or poplar, meeting AWI Premium Grade Standards.

E. Blocking and furring at base and walls shall comply with American Softwood Lumber Standard PS 20-70 and with specific grading requirements of SPIB: Kiln dried (KD15), Structural Light Framing, Nº. 2 grade, free of warping and large knots.

F. Internal concealed framing for casework: Kiln-dried, (KD15), eastern pine, poplar, eastern spruce, or southern pine, conforming to AWI Premium grade.

G. Fir plywood for concealed from view applications in conjunction with the various casework items: APA C-C PLUGGED EXT.

2.2 PLASTIC LAMINATE FACING
A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
   1. Basis of Design (PL-1A,1B): Ralph Wilson Plastics Co. (Wilsonart), Temple TX.
   2. Formica Corp., Cincinnati, OH.
   3. Pioneer Plastics Corp. (Pionite), Auburn ME.
   4. Nevamar Corp., Odenton MD.

B. Plastic laminate, general purpose, conforming to NEMA LD3.1 -1991 Grade GP50, nominal 0.050 inch thickness, in a low non-directional texture in color price group selected by the Architect.
   1. General purpose grade laminate shall be used for all exposed to view surfaces including:
      a. Exposed outward face of cabinet fronts and closure trim.
      b. Cabinet doors (all sides).
      c. Drawer fronts (all sides).
      d. Interior surfaces of open cabinets (without doors).
      e. Plastic laminated trim.

C. Plastic laminate, cabinet interior grade, conforming to NEMA LD3-1985 Grade CL20, 0.020 inch nominal thickness, in a low non-directional texture in solid color price group as selected by the Architect.
   1. Cabinet interior grade laminate may be used for the interior surfaces of all ‘closed cabinets,’ where general purpose grade is not required.
   2. All shelving shall be cabinet interior grade.

D. Plastic laminate, unfinished balancing (backer) sheet, conforming to NEMA LD3-1985 undecorated laminate, Grade BK20, 0.020 inch nominal thickness.

E. Edging:
   1. Edging for plastic laminate shelving: Flexible polyethylene tee moulding, having a 3/4 inch face, equal to Outwater Plastics, Woodridge NJ., (telephone 800 835-4400), model
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2.3 BACKING FOR LAMINATES

A. All laminate components with the exception of all toe spaces: Mattformed three layer medium density panel (PB), graded M2 per ANSI A 208.1 with a minimum density of 48 pounds per cubic foot or equivalent hardwood plugged plywood complying with PS 51-71.

1. "No Formaldehyde Added": Provide board which is fabricated using pre-consumer recycled wood fibers and an exterior-grade urea-formaldehyde free resin binder. Product shall contain no formaldehyde additives. Acceptable products include the following or approved equal.
   b. Plummer Forest Products, Post Falls, ID, product “PFP particleboard”.
   c. Rodman Industries, Oconomowoc, WI, product: “Rodman Resincore I”.

2. Thicknesses:
   a. 3/4 inch thick at cases.
   b. 1 inch thick at shelves under 30 inches wide.
   c. 1 1/8 inch thick at shelves 30 inches or more wide.

3. Thicknesses:
   a. Typical: 3/4 inch thick panels, except as otherwise indicated or specified.
   b. Doors over 36 inches tall: provide 1-1/4 inch thick panels.

B. At all toe spaces: APA MARINE A-A EXT, fir veneer marine grade plywood, with plugged cores and sanded faces, 3/4 inch thick.

2.4 CABINET HARDWARE

A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following:
   1. Häfele America Company, Archdale, NC.
   2. Sugatsune, Chicago, IL, www.sugatsune.com
   3. Accuride Corp., Santa Fe Springs, CA.
   6. Engineered Products Company, Flint, MI.
   7. Glynn-Johnson, Indianapolis, IN.
   8. H.B. Ives Company, Wallingford, CT.
   9. Julius Blum, Inc., Stanley, NC.
   10. Knape & Vogt, Grand Rapids, MI.
   11. (Lamp) Sugatsune America, Inc. Caron, CA.
   12. Mepla Inc., High Point, NC.
   14. Stanley Hardware, New Britain, CT.
   15. Waterloo Furniture Components, Ontario, Canada.

B. Door and drawer pulls:
   1. Basis of Design: Hafele Bow Handle, Aluminum CTC 128mm.

C. Locks:
   1. General:
      a. Provide at least three keys per keyed alike group.
      b. Finish: lock plug finish "nickel".
   2. Locks for drawers and doors: “DualAxess - 90 Deg. Cam Turn” as manufactured by CompX International Inc, Dallas, TX.
D. Catches: Magnetic touch latch type.

E. Roller latches: Head frame mounted, stainless steel or cast bronze with brushed chrome finish, conforming to ANSI A 156.16, with manufacturers standard strike, equal to Glynn-Johnson model "1152B - Combination Roller Latch/Angle Stop".

F. Casework hinges:
   1. General:
      a. All hinges shall be screw-on type. No press-in or insertion type hinges will be accepted.
      b. All hinges, after installation, shall be integral with the base plate and substrate, providing a contiguous system that ensures against accidental release.
      c. All hinges shall withstand a weight load of 150 pounds, minimum.
      d. Provide restricting hinges, (equal to Häfele "Door Restraint Hinges") at upper and lower cabinet doors that abutt walls and are prone to impact.
   2. Hinge for full overlay cabinet doors: Self closing concealed hinge having maximum 120 degree angle of opening. Hinges shall be equal to Blum "Screw on Face Frame #71T5550", with straight arm configuration.
      a. Number of hinges: Provide number of hinges indicated in Drawings, or if not indicated, provide number recommended by manufacturer for size and weight of door.
      b. Number of hinges: Provide number of hinges indicated in Drawings, or if not indicated, provide number recommended by manufacturer for size and weight of door.
         ****Specify product below only when requested****
   3. Casework hinges: Five knuckle institutional, offset type for all swinging doors. Hinges shall be 2-1/2" long. Hinges are mounted with flathead screws, so applied to cabinets to withstand a weight load of 150 pounds minimum. Hinge finish: satin stainless steel.
      a. Number of hinges:
         1) Doors 48 inches and less in height: 2 hinges.
         2) Doors over 48 inches in height: 3 hinges.

G. Pad silencers for doors: 10 mm (3/8 inch) diameter, self-adhesive resilient plastic or nylon buttons, at least 2 per door, in clear color.

H. Drawer Slides (provide one pair per drawer except as noted otherwise):
   1. For desk and casework drawers (excluding file drawers): Full extension type, 100 pounds per pair minimum rated capacity, steel ball bearing rollers, lever disconnect, drawer hold in detent feature.
      a. Acceptable slides, include the following, or approved equal:
         1) Accuride Nº. 3832E
         2) Knape and Vogt Nº. 8400.
         3) Häfele Nº. 3832.
      b. Finish: clear lacquered zinc.
   2. For pencil drawers: 3/4 extension type, 45 pounds per pair minimum rated capacity, steel ball bearing rollers, friction disconnect.
      a. Acceptable slides include the following, or approved equal:
         1) Accuride Nº. 2006 (regular mount), Nº. 2009 (bracket mount).
         2) Knape and Vogt Nº. 8200
         3) Häfele Nº. 2009
   3. For under drawer mounting: Single extension type, 35 pounds minimum rated capacity, steel ball bearing rollers, drawer hold in detent feature.
      a. Acceptable slides include the following, or approved equal:
         1) Accuride Nº. 1029.
         2) Knape and Vogt Nº. 1500.
3) Häfele №. 423.55.9xx 7xx (Note: xx number will vary depending on depth of drawer).
   b. Finish: clear lacquered zinc.

I. Wire management conduit and receptacle system: Medium voltage wire conduit system as manufactured by the Wiremold Company, West Hartford CT.

2.5 ACCESSORIES

A. Edge protection: Stylex trim piece for all edges and corners as indicated on the Drawings.

B. PVC Edging for plastic laminate casework:
   1. Manufactured by The Cloverdale Company (Band-it Brand), Cloverdale VA., or equal.
   2. Thickness: 2mm thick for door and drawer edges; 1mm for exposed edges of casework bodies.
   3. Edges: Square.
   4. Custom colors to match plastic laminate colors.

C. Edging for adjustable shelving: Flexible PVC tee moulding, having equal to Outwater Plastics, Woodridge, NJ, in color as selected by the Architect.
   1. All sides of shelving shall receive edging, regardless of exposure.

D. Glue for lamination and fabrication of wood and plywood items: Exterior Grade, phenolic resin glue.

E. Fasteners:
   2. Bolts, nuts, washers, lags, pins, and screws: Of size and type to suit application chrome finish in exposed-to-view locations.

F. Counter Support Brackets: Equal to Rakks Flush Mount Counter Supports by Rakks/Rangine Corp, Needham MA.
   1. Construction: Fabricated from horizontal aluminum T section and vertical aluminum L section. Vertical leg designed to attach to side of supporting stud and be concealed by gypsum board or other wall finish.
      a. Model EH-1212FM for up to 18 inch deep counters.
      b. Model EH-1818FM for up to 24 inch deep counters.
      c. Model EH-1824FM for up to 30 inch deep counters.
   2. Factory applied finishes: Exposed aluminum surfaces shall be free of scratches and other serious blemishes and be factory finished with:
      a. Electrostatically applied, powder paint coating complying with AAMA 2603 (minimum), custom color selected by Architect.

G. Wire Management Grommets and Covers: 2 inch diameter, as manufactured by Doug Mockett & Company, Manhattan Beach CA., model number “ MM3 with 3A cover” or approved equal.
   1. Grommet Finish: Provide in metallic finish selected by the Architect from Manufacturer’s standard finishes.
   2. Locations: Provide where shown on Drawings, and if not shown, allow the following numbers of grommets; exact locations to be determined in field.
      a. For counters 6 feet or less provide 2 wire grommets and covers.
      b. For counters over 6 feet, provide 1 wire grommet and cover for every 42 inches of counter, or fraction thereof.

2.6 FABRICATION - GENERAL

A. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.

B. Coordinate the fabrication of casework with that of the various trades responsible for installing materials and items which will be inserted into, or applied to, the casework surfaces. Obtain and verify templates, dimensions, and instructions from the respective trades before making cut-outs, holes, slots, and other cutting in the casework.
C. Shop assemble custom casework for delivery to site. Deliver in assemblies as large as possible for entrance into the designated areas. Provide for concealed job connections of adjacent units.

D. Fabricate, install and finish all work so that both sides of panels, doors, shelves and other casework are of balanced construction, to prevent warping.

E. Fit corners and joints hairline, secure with concealed fasteners.

F. Finish all solid wood and plywood surfaces smooth, and free from all machine and tool marks that will show through the wood veneer or facing materials.

G. Make all joints tight, and form to conceal shrinkage. Glue all miters having a dimension of 4 inches or more from heel to point.

H. Finished work shall be free from visible adhesive and pencil marks.

2.7 FABRICATION - CASEWORK

A. Fabricate casework in accordance with requirements of specified AWI Grade and the following additional requirements:

1. Cabinets shall be in flush overlay construction, with drawer fronts and hinged doors overlapping openings a minimum of 1/4 inch all four sides.

2. Fabricate cabinets in integral units, each completely enclosed, without the use of common partitions.

3. Fabricate plastic laminated casework with top and bottom fillers and corner panels described as optional for Custom Grade Work in the Quality Standards.

4. Drawers:
   a. Laminated drawer fronts: High density laminate over 3/4 inch specified core material. Drawer fronts shall be applied to separate drawer body component sub-front.
   b. Drawer bottoms (plastic laminated casework): 1/4 inch thick color polyester laminate, housed and glued into front, sides and back.
   c. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity.
   d. Reinforce drawer bottoms as required with intermediate spreaders.

5. Doors: Square edge design, 3/4 inch thick, without any profiling and shall fully overlap the cabinet frame.
   a. Laminate doors: Fabricate doors with particle board core and front and rear faces high-pressure laminate, of selected color.
   b. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.

6. Base cabinets: Provide full horizontal top frame with glued and doweled joints, 3/4 inch plywood end panels and bottom. Bottom shall be glued and doweled and let into routed end panels. Provide 4 inch high toe rail, securely screwed to the end panels and to the bottom panel by concealed glue blocks.

7. Wall cabinets: Provide same finishes as base cabinets, with 3/4 inch thick top and bottom veneered plywood panels. Top and bottom panels shall be glued and doweled and let into routed end panels. Back of case shall be recessed and let into routed end panels and further secured with glue blocks.

8. Door and drawer spreaders: Provide minimum 3/4 thick full width cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, and close off reveal. Front edge to be match face of adjacent cabinet doors/drawers.

2.8 FABRICATION OF PLASTIC LAMINATE CLAD ITEMS

A. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
B. Except as otherwise specified hereunder, fabricate plastic laminate clad items in strict accordance with the details on the Drawings, the approved shop drawings, and workmanship standards set forth in the AWI Quality Standards Section 400, for specified Quality Grade.

C. Shop fabricate all plastic laminate clad items. Adhere plastic laminate to particle board backing sheets by cold-press-method. Use of contact cements are not permitted. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Apply laminate backing sheet to reverse side of all laminated, panels, shelving and tops.

D. Cap edges with specified banding, matching color of plastic laminate panels.
1. Casework facing: Machine apply flat PVC banding, 0.018 inch (0.050 mm), using waterproof hot melt adhesive.
2. Drawer and door fronts: Machine apply to all four edges, 2mm thick PVC banding, using waterproof hot melt adhesive, corner radiused profile for consistent design and safety.
3. Shelving: Machine apply to all four edges, 2mm thick PVC banding, using waterproof hot melt adhesive, corner radiused profile for consistent design and safety.

E. Fit corners and joints hairline. Make all joints and miters tight, secure with concealed fasteners.

2.9 FACTORY FINISHING
A. General: Factory finish to be to comply with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations.

B. Transparent finish: AWI Premium Grade Factory Finish System 5, having a Medium rubbed effect with a sheen of 24° to 28° gloss units per ASTM D523. Finish system shall not substantially increase flame spread.
1. Finish system shall include the following:
   a. Wash coat, reduced conversion varnish.
   b. Wash coat, vinyl.
   c. Stain coat.
   d. Sealer, reduced conversion varnish.
   e. Sealer, vinyl.
   f. First topcoat.
   g. Second topcoat.

C. Concealed surfaces: Thoroughly coat all concealed surfaces of finish woodwork before assembling with two coats of clear wood preservative.

D. Field Touch-up: Shall be the responsibility of the installing contractor and shall include the filling, and touch-up of exposed job made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and marks, and final cleaning up of the finished surfaces.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
1. Verify adequacy of blocking, backing and support framing for all finish carpentry work.
2. Examine pre-fabricated woodwork before installation and verify that back priming has been completed and all packing has been removed.
3. Do not install base cabinets and other floor mounted casework unless the finished floor is in place.
4. Beginning of installation means acceptance of existing substrate and project conditions.

3.2 PREPARATION
A. Before installing work under this section, woodwork shall be conditioned to average prevailing humidity conditions in areas of installation.
B. Protect other Work against undue soilage and damage by the exercise of reasonable care and precautions. Clean, repair, or replace any work so damaged and soiled to the acceptance of the Architect.

3.3 INSTALLATION - GENERAL
A. Install work in accordance with the latest AWI quality standards in grade specified herein, under the Article entitled "QUALITY ASSURANCE".
B. Woodwork shall be installed plumb, level, true and straight without distortions.
   1. Use concealed shims as required.
   2. Work shall be installed to a tolerance of 1/8 inch in 8 feet for plumb and levelness, including tops.
   3. There shall be no variations in flushness of adjoining surfaces.
C. Tops and woodwork shall be scribed and trimmed to fit adjoining work.
   1. Where cuts occur, refinish surfaces and repair damaged finishes
D. Secure woodwork to anchors or built-in blocking or blocking directly attached to substrates.
   1. Secure woodwork to grounds, furring, stripping and blocking as required with countersunk, concealed fasteners and blind nailing performing a complete installation.
   2. Use thin gauge finishing nails for exposed nailing, countersunk and filled flush with woodwork finished surface.
      a. Match final finish materials where transparent finish is indicated.

3.4 INSTALLATION - CASEWORK
A. Install casework without distortion so that doors and drawers fit openings properly and are accurately and evenly aligned.
   1. Install end cabinet panels with a continuous bead of Sealant Type SL applied to bottom edge that abuts finish flooring. Immediately remove all excess sealant from surfaces of the casework and flooring.
B. Adjust casework hardware centering the doors and drawers in the openings, and provide unencumbered operation.
C. Complete the installation of hardware and accessory items as indicated.
D. Maintain veneer sequence matching of casework with transparent finish, where so manufactured.
E. Tops: Anchor tops securely to base units and to other support systems as required.
F. Install back and side splashes with a continuous bead of Sealant Type SL applied to splash edges that abut materials and adjoining splashes. Immediately remove all excess sealant from surfaces of the casework.

3.5 FIELD FINISHING
A. Except where expressly noted otherwise on Drawings, shop finish all woodwork. Where field finishing is indicated or scheduled on Drawings, finishing Work shall be as specified under Section 099100 - PAINTING.

3.6 TOLERANCES
A. Maximum variation from true position 1/16 inch with a maximum of 1/32 inch offset from true alignment with adjoining surfaces intended to be flush.

3.7 ADJUSTING
A. To whatever extent work was not completed at shop or prior to installation of woodwork, perform and complete the specified finishing of woodwork.
B. Repair damaged and defective woodwork where possible eliminating defects functionally and visually.
   1. Where not possible to repair damaged or defective work, replace with matching new work.
2. Adjust joinery for uniform appearance.
   C. Adjust doors and drawers for smooth and balanced movement, lubricate hardware for use.

3.8 CLEANING
   A. Daily clean work areas by sweeping and disposing of scraps and sawdust.
   B. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area leave area in broom-clean condition.
   C. Remove protective material from pre-finished surfaces, immediately prior to Final Acceptance.
   D. Carefully clean exposed and semi-exposed wood surfaces, in strict accordance with fabricator’s instructions. Touch-up shop-applied finishes to restore damaged or soiled areas, matching adjoining finish.
   E. Wash down plastic laminate with a solution of mild detergent in warm water, applied with soft clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
   F. Clean and polish hardware, and bright metal trim components.

3.9 PROTECTION
   A. Protect installed woodwork and maintain specified conditions, in a manner acceptable to both fabricator and installer. Ensure that work of this Section will not be damaged or soiled, and is completely free of defects at the time of final acceptance of Project by the Architect.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. Solid polymer countertops, (with integral sinks as located on the drawings) skirts, backsplash and other trim pieces at locations as indicated on the Drawings.
   B. Solid surface window sills.
   C. Make all cut-outs within solid surfacing items as required to accommodate sinks, and other plumbing fixtures, from templates provided by the respective trades.

1.2 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
   B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
   C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
   D. Section 061000 - ROUGH CARPENTRY: Wood blocking.
   E. Section 064000 - ARCHITECTURAL WOODWORK: Shop fabricated millwork and architectural woodwork.

1.3 SUBMITTALS
   A. See Section 013000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Product Data: Provide data on specified component products.
   C. Indicate product description, fabrication information and compliance with specified performance requirements.
   D. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, design load parameters, methods of support, integration of plumbing components, and anchorages.
   E. Samples: Submit two samples representative of each component, 2 by 2 inch (50 by 50 mm) in size, illustrating color, texture, and finish.
   F. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.
   G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner’s name and registered with manufacturer.

1.4 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
   B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND PROTECTION
   A. Deliver fabrications appropriately wrapped in protective materials.
   B. Deliver materials to site when construction is ready for installation. Store materials indoors in a controlled environment as recommended by the manufacturer.
   C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation.
1.6 PROJECT CONDITIONS
   A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.7 ENVIRONMENTAL REQUIREMENTS
   A. Maintain relative humidity and ambient temperature during and after installation at levels recommended by manufacturer.

1.8 WARRANTY
   A. See Section 017800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
   B. Provide ten year manufacturer warranty against defects in materials. Warranty to cover material and labor to repair or replace defective materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. Basis of Design (SSM-1A, SSM-2A): To establish a standard of quality, design and function desired, Drawings and specifications have been based on The DuPont Company; product: “Corian”.

2.2 SOLID SURFACING FABRICATIONS
   A. Polymer solid surfacing material: Non-porous surfacing material, homogeneously composed of natural minerals and high-performance polymer. Fabricated sizes and profiles as shown on the Drawings, in colors and finishes as selected by Architect.
      1. Solid surfacing material shall be NSF (National Sanitation Foundation) listed under publication 51 - Plastic Materials and Components used in Food Equipment and bear the “component” mark.
      2. Solid surfacing material shall meet ANSI Z124.3 or ANSI Z124.6.
   B. Solid surfacing material shall have minimum physical and performance properties as specified herein below:
      1. Superficial damage to a depth of 0.010 inch (0.25 mm) shall be repairable by sanding and/or polishing.
      2. Surface Burning Characteristics: Class I or A in accordance with ASTM E84, and as follows:
         a. Flame Spread Index: 25 or less.
         b. Smoke Developed Index: 450 or less.
      3. Performance Characteristics:
         a. Tensile Strength: 6,000 psi minimum, as tested in accordance with ASTM D638.
         b. Tensile Modulus: 000001.5 psi, as tested in accordance with ASTM D638.
         c. Tensile Elongation: 0.4% minimum, as tested in accordance with ASTM D638.
         d. Flexural Strength: 10,000 psi minimum, as tested in accordance with ASTM D790.
         e. Flexural Modulus: 000001.2 psi, as tested in accordance with ASTM D790.
         f. Thermal Expansion: 0.000018 inch per inch per degree F, maximum, as tested in accordance with ASTM D696.
         g. Hardness:
            4. Rockwell "M" Scale: Greater than 85, as tested in accordance with ASTM D785.
            5. Barcol Impessor: 57, as tested in accordance with ASTM D2583.
               a. Gloss (60 degree Gardner): 5 (matte) - 75 (highly polished), as tested in accordance with ANSI Z124.
               b. Light Resistance: No effect (Xenon Arc), as tested in accordance with NEMA LD 3-2000 Method 3.3.
               c. Wear and Cleanability: Passes, as tested in accordance with ANSI Z124.3 and Z124.6.
               d. Stain Resistance: Passes, as tested in accordance with ANSI Z124.3 and Z124.6.
e. Fungus and Bacteria Resistance: Does not support microbial growth, as tested in accordance with ASTM G21 and G22.

f. Boiling Water Resistance: No visible change, as tested in accordance with NEMA LD 3-2000 Method 3.5.

g. High Temperature Resistance: No change, as tested in accordance with NEMA LD 3-2000 Method 3.6.

h. Izod Impact (Notched Specimen): 0.28 foot pounds per inch of notch, as tested in accordance with ASTM D256, Method A.

i. Ball Impact Resistance (Sheets): No fracture using 1/2 pound ball, as tested in accordance with NEMA LD 3-2000 Method 3.8:
   1) 1/4 inch thickness: 36 inch drop.
   2) 1/2 inch thickness: 144 inch drop.

j. Long-Term Water Absorption: As tested in accordance with ASTM D570:
   1) 1/4 inch thickness: 0.8%.
   2) 1/2 inch thickness: 0.6%.
   3) 3/4 inch thickness: 0.4%.

k. Toxicity: As tested in accordance with the Pittsburgh Protocol Test ("LC50" Test):
   1) Solid Colors: 99.
   2) Patterned Colors: 66.

l. Specific Gravity (Density): 1.7 grams per cubic centimeter, as tested in accordance with ASTM D792.

m. Approximate Weight: For 1/4 inch thickness = 2.2 pounds per square foot.

C. Solid surfacing countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Sheet thicknesses: As indicated on Drawings.
   2. Exposed Edge Treatment: Refer to Drawings for edge types and additional information.
   3. Back and end splashes: Same sheet material unless noted otherwise; square top, minimum 4 inches (100 mm) high by 1/2 inch (12.5 mm) thick, in locations and heights as shown on the Drawings.
   4. Color, finish and pattern: As selected by the Architect from the manufacturer's full range of available options, unless otherwise indicated.
   a. Basis of Design: "Corian No. 810".

2.3 ACCESSORIES
A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

D. Conductive Tape: Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.

E. Insulating Felt Tape: Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

F. Joint Adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, non-porous joints, with a chemical bond.

G. Panel Adhesive: Manufacturer's standard panel adhesive.

H. Sealant: As specified in Section 079200 - JOINT SEALANTS, appropriate to application, and compatible with adjacent materials.
   1. Color: Match color of product selected.

I. Polishing Cream: Compatible polishing cream to achieve specified sheen to gel coat.
J. Counter Support Brackets: Equal to Rakks Counter Supports by Rakks/Rangine Corp, Needham MA, with standard white color powder coat finish.
   1. Model EH-1818 for 24 inch counters.
      a. Provide plastic laminate end panels at ends of all countertops and as additionally indicated on the Drawings.

K. Wire Management Grommets and Covers:
   2. Color: As selected by the Architect from manufacturer’s full range of available options.
   3. Locations: Provide where shown on Drawings, and if not shown, allow the following numbers of grommets; exact locations to be determined in field.
      a. For counters 6 feet or less provide 2 wire grommets and covers.
      b. For counters over 6 feet, provide 1 wire grommet and cover for every 42 inches of counter, or fraction thereof.

L. Shelf Supports.
   1. Shelf pins for laminated shelving: plug-in type for 5mm diameter hole, Häfele model number 282.11.710 cast zinc alloy with nickel plated finish and recessed seat.

2.4 FABRICATION
A. Fabricate countertops in one piece or adhesively joined sections to fit size and shape indicated.
   1. Form joints between components using manufacturer’s standard joint adhesive. Joints to be inconspicuous in appearance and without voids. Attach 2 inch wide reinforcing strip of same material under each joint.
   2. Rout and finish component edges to a smooth, uniform finish.
   3. Ease corners and edges.
   4. Gel coat the finish exposed surfaces smooth and polish to a uniform matte finish, with a gloss rating of 5 - 20.

B. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to align with fronts (face of cabinet doors) and ends of cabinets.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
   4. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
      a. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

C. Prepare countertops for undermount design sinks furnished and installed under Division 22 - PLUMBING.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify that field measurements are as indicated.
B. Verify that joint preparation and affected dimensions are acceptable.
C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 PREPARATION
A. Field Measurement:
   1. Measure actual room dimension at the site, prior to fabrication, to assure proper fit and installation.

B. Blocking:
   1. Coordinate location of blocking behind all mounting locations for components.
2. Provide all blocking required for anchorage or support of all items where such blocking is not to be installed concealed in walls or bulkheads.
3. Coordinate all concealed blocking to be provided under Section 061000 - ROUGH CARPENTRY.

C. Coordinate mechanical and electrical provisions that are to be integrated into components.

3.3 INSTALLATION

A. Install components in accordance with shop drawings and manufacturer's instructions.
B. Align work plumb and level.
C. Form joints using manufacturer's approved adhesive, with joints inconspicuous in finished work.
D. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
E. Rigidly anchor to substrate to prevent misalignment.
F. Attach countertops securely to base units or support brackets in accordance with manufacturer's printed instructions.
G. Provide backsplashes and endsplashes as indicated. Adhere loose backsplashes and endsplashes to countertop using manufacturer's standard color-matched silicone sealant.
H. Seal between wall and component with manufacturer's recommended silicone sealant.
I. Carefully dress joints smooth, remove surface scratches and clean entire surface.

3.4 TOLERANCES

A. Maximum Variation from True Dimension: 1/8 inch (3 mm).
B. Maximum Offset from True Position: 1/8 inch (3 mm).

3.5 CLEANING

A. Clean and polish surfaces in accordance with manufacturer's instructions.

3.6 PROTECTION

A. Protect installed components from subsequent construction operations.
B. Do not permit construction near unprotected surfaces.
C. Replace all scratched, marred, or otherwise damaged materials that cannot be restored to "like new" appearance with new, undamaged materials.

END OF SECTION
SECTION 078100
APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Patch existing fireproofing disturbed or otherwise damaged by the Work.
   1. The General Contractor shall be responsible for typical patching and repair of cementitious fireproofing materials made necessary by the normal activities of general and sub-contract construction. Where the scope of patching and repair of such materials exceeds typical expectations the General Contractor shall prepare and submit a Change Request Proposal (CRP) that identifies the reason for the request, the total cost of remediation, and a cost itemization of the labor and materials involved in it. Acceptance of the CRP shall be required prior to execution of the patching and repair Work.

B. Fireproofing of interior structural steel not exposed to damage or moisture.

C. Fireproofing of structural steel exposed to damage or moisture.

D. Preparation of fireproofing for application of exposed finish specified elsewhere.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 017329 - CUTTING AND PATCHING: Procedural and administrative requirements for cutting and patching.

E. Section 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS: Waste management and recycling during final cleaning.

F. Division 5 - STRUCTURAL.

1.3 REFERENCE STANDARDS

A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.

B. Definitions: SFRM (Sprayed Fire-Resistant Materials) is spray-applied fireproofing as specified under this Section and defined under the International Building Code.

1.4 ADMINISTRATIVE REQUIREMENTS

A. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Pre-Installation Meetings: At least two weeks prior to commencing the work of this Section, conduct a pre-installation conference at the Project site. Comply with requirements of Section 013000 - ADMINISTRATIVE REQUIREMENTS. Coordinate time of meeting to occur prior to installation of work under the related sections named below.

1. Required attendees: Owner, Architect, Construction Manager, Fireproofing Applicator’s Project Superintendent, Fireproofing manufacturer’s technical representative and representatives of other related trades as directed by the Architect or Contractor.

2. Agenda:
   a. Scheduling of fireproofing operations.
   b. Review of staging and material storage locations.
   c. Coordination of work by other trades.
   d. Installation procedures for ancillary equipment.
   e. Protection of completed Work.
   f. Establish weather and working temperature conditions to which Architect and Contractor must agree.
   g. Emergency rain protection procedure.
   h. Discuss process for manufacturer’s inspection and acceptance of completed Work of this Section.

C. Sequencing:

1. The spray-applied fire resistive material shall only be applied to steel deck, which has been fabricated and erected in accordance with the criteria set forth by the Steel Deck Institute.

2. The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roof is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and construction roof traffic has ceased.
   a. Fire protection shall not be applied to steel floor decks prior to the completion of concrete work on that deck.
   b. When occasional roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.

D. Scheduling: The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of sprayed fire protection is complete in an area.
1.5 SUBMITTALS
   A. See Section 013000 - Administrative Requirements, for submittals procedures.
   B. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and limitations of fireproofing.
   C. Test and Evaluation Reports:
      1. Bond strength of fireproofing: ASTM E 72, tested to provide minimum bond strength twenty times weight of fireproofing materials.
      2. Fire test reports of fireproofing application to substrate materials similar to project conditions.
      3. Reports from reputable independent testing agencies, of product proposed for use, which indicate conformance with ASTM E 119 and ASTM E 84
   D. Manufacturer's Instructions and typical details: Indicate special application procedures or conditions.
   E. Closeout Submittals: Submit the following under provisions of Section 017800 - Closeout Submittals.
      1. Certificates: Installers certificate stating that sprayed fireproofing has been completed in full accordance with requirements to provide necessary fire resistance ratings.
      2. Record Documentation: Installer’s Field Reports stating environmental conditions during the installation of fireproofing materials, include temperature and humidity conditions.
      3. Bonds and Warranty Documentation:
         a. Manufacturer's Warranties and Guarantees as specified elsewhere herein this Section.

1.6 QUALITY ASSURANCE
   A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
   B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of fireproofing.
   C. Qualifications:
      1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING
   A. Delivery and Acceptance Requirements:
      1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
      2. Deliver materials, factory proportioned and mixed, in original, unopened packages bearing the name of the product, manufacturer’s name, plant identification, lot number and Underwriter’s Laboratories, Inc. label.
   B. Storage and Handling Requirements:
      1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
      2. Store all materials in an elevated dry location, protected by waterproof coverings.
      3. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
   C. Damaged material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or show other evidence of damage.
1.8 FIELD CONDITIONS
   A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F (4 degrees C) or when temperature is predicted to be below said temperature for 24 hours after application.
   B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.
   C. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.9 WARRANTY
   A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
   B. Special Warranty: Provide 2 year warranty which shall include failure of fireproofing, including: cracking, checking, dusting, flaking, spalling, separation and blistering. Failure to provide such performance will require re-installation to repair to satisfaction of Owner at no additional cost.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers for Sprayed-On Fireproofing:
      1. AD/Carboline; Fireproofing Products Division of RPM Inc.; St. Lous, MO (“AD/Carboline”).
      4. Southwest Fireproofing Products Company; Albuquerque, NM (“Southwest”).

2.2 DESCRIPTION
   A. General: Spray applied fireproofing, factory proportioned and mixed meeting the following requirements:
      1. Sprayed fireproofing materials (SFRM) shall be free of all forms of asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall provide certification of such upon request.
      2. Fireproofing materials shall not be subject to losses from finished application by sifting, flaking or dusting.
      3. Fireproofing shall not deform more than 10 percent under 500 pound per square foot compressive forces in accordance with ASTM E 761.
      4. Bare, shop-coated, and galvanized steel sheets with the fireproofing applied shall be kept at 90 degrees Fahrenheit and 70 percent relative humidity for 240 hours without evidence of corrosion of steel, tested in accordance with ASTM E 937.
      5. Corrosion Resistance: When tested in accordance with ASTM E937, the material shall not promote corrosion of steel.
      6. Noncombustibility: When tested, the material shall be noncombustible.
      7. Surface Burning Characteristics: When tested in accordance with ASTM E84, the material shall exhibit the following surface burning characteristics:
         a. Flame Spread  10
         b. Smoke Developed  0

   B. Regulatory Requirements:
      1. Provide under Section 014000 - QUALITY REQUIREMENTS: Certification by an independent testing laboratory acceptable to the Owner, that materials, dry densities, thickness, and application procedures satisfy the requirements of the governing laws, building code, and UL requirements, with respect to the minimum protection requirements specified herein when tested in accordance with ASTM E 119.

2.3 PERFORMANCE/DESIGN CRITERIA
   A. Materials, procedures for application, dry densities, and thicknesses necessary to provide the required protection shall be tested and rated by UL in accordance with the procedures of UL 263 (ASTM E119) for the uses indicated.

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B. Fire ratings interpolated or extrapolated from actual test data will not be acceptable. Provide evidence prior to application that proposed materials, installation methods and materials have been approved by all authorities having jurisdiction.

C. Thickness and density: Thickness and dry density of fire protection material shall be according to the manufacturer’s data and UL requirements to provide fire resistance ratings as designated on the Drawings.

2.4 MATERIALS

A. Spray applied fireproofing Type A - “Standard Density”: For structural steel elements including: Built-up trusses, steel deck, beams, and columns, and all other concealed applications except as otherwise indicated on the drawings, or as otherwise specified herein:

1. Acceptable products:
   a. AD/Carboline, product: “Pyrolite 15HY”.
   b. W.R. Grace & Company, product: “Monokote Type MK-6”.
   c. Isolatek International, product: “Cafco 300”.
   d. Southwest, product: “5GP”.

2. Performance Criteria:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Test Value/Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>ASTM E761</td>
<td>3.5 lb/in², minimum</td>
</tr>
<tr>
<td>Bond Strength</td>
<td>ASTM E736</td>
<td>200 lb/ft², minimum</td>
</tr>
<tr>
<td>Air Erosion</td>
<td>ASTM E859</td>
<td>3.5 grams/ft², maximum</td>
</tr>
<tr>
<td>Deformation</td>
<td>ASTM E759</td>
<td>No evidence of cracking or delamination</td>
</tr>
<tr>
<td>Bond Impact</td>
<td>ASTM E760</td>
<td>No evidence of cracking or delamination</td>
</tr>
<tr>
<td>Dry Density</td>
<td>ASTM E605</td>
<td>14 lb/ft², minimum</td>
</tr>
</tbody>
</table>

3. Deflection: When tested in accordance with ASTM E759, the material shall not crack or delaminate when the non-concrete topped galvanized deck to which it is applied is subjected to a one time vertical center load resulting in a downward deflection of 1/120th of the span.

4. Bond Impact: When tested in accordance with ASTM E760, the material shall not crack or delaminate from the concrete topped galvanized deck to which it is applied.

5. Cohesiveness/Adhesion (bond strength): When tested in accordance with ASTM E736, the material applied over uncoated or galvanized steel shall have a minimum bond strength of 150 psf (pounds per square foot) [667N].

6. Air Erosion: When tested in accordance with ASTM E859, the material shall not be subject to losses from the finished application greater than 0.025 grams per sq. ft.

7. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 750 psf (pounds per square foot).

8. Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL design, or as required by the Authority having jurisdiction, or shall have a minimum average density of 15pcf (pounds per cubic foot).

9. Resistance to Mold: Formulate the fireproofing material at the time of manufacturing with a mold inhibitor.
   a. Test fireproofing material per ASTM G-21 and show resistance to mold growth for a period of 21 days for general use and 60 days for materials installed in plenums.
      1) Tested fireproofing material shall demonstrate resistance to mold growth when inoculated with aspergillus niger.

10. The material shall have been tested and reported by Underwriters Laboratories, Inc. (UL) in accordance with the procedures of UL 263 (ASTM E119).

B. Spray applied fireproofing Type B - “Medium Density”: Steel columns, steel framing and steel decking exposed within elevator shafts, and at all non-concealed (exposed to view) conditions:

1. Acceptable products:
a. AD/Carboline, product: “Pyrolite 22”.
c. Isolatke International, product: “Cafco 400”.
d. Southwest, product: “7GP”.

2. Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL/UC design or as required by the authority having jurisdiction, or shall have a minimum average of 22 pcf (pounds per cubic foot).

3. Cohesion/Adhesion (bond strength): When tested in accordance with ASTM E736, the material applied over uncoated or galvanized steel shall have an minimum bond strength of 430 psf (pounds per square foot) [1913N].

4. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 7,344 psf (pounds per square foot).

C. Potable water shall be used for the application of sprayed fireproofing materials.

D. Adhesive: Bonding adhesive for fibrous materials as recommended and supplied by the fireproofing material manufacturer. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

E. Sealer:
   1. AD/Carboline, product: “Carboguard 1390”.
   4. Southwest, product as recommended by manufacturer.

F. Mold Inhibitor: Mold inhibitor shall be added to fireproofing materials in accordance with manufacturer's instructions.

G. Spray applied fireproofing Type C - “High Density”: For fireproofing all concealed and exposed structural steel elements including, but not limited to: built-up trusses, steel deck, beams, and columns.
   1. Acceptable products:
      a. Southwest, product: “7HD”.
      b. AD/Carboline, product: “Pyrocrete 40”.
      c. W.R. Grace & Company, product: “Monokote Type Z-146”.
      d. Isolatke International, product: “Fendolite M-II”.
   2. Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL/ULC design or as required by the Authority having jurisdiction, or shall have a minimum average of 39 pcf.
   3. Cohesion/Adhesion (bond strength): When tested in accordance with ASTM E736, the material applied over uncoated or galvanized steel shall have an average bond strength of 1,000 psf (pounds per square foot) [4448N]
   4. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 43,200 psf (pounds per square foot).

H. Potable water shall be used for the application of sprayed fireproofing materials.

I. Adhesive:
   1. Bonding adhesive for fibrous materials as recommended and supplied by the fireproofing material manufacturer. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.
   2. Sealer:
      a. AD/Carboline, product: “Carboguard 1390”.
c. Isolatek International, product: "Bond-Seal".
d. Southwest, product as recommended by manufacturer.

3. Mold Inhibitor: Mold inhibitor shall be added to fireproofing materials in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   1. Inspect all surfaces and verify that they are in proper acceptance of existing substrate and site conditions.
      a. Contact fireproofing manufacturer for procedures on handling primed / painted steel.
      b. Ensure clips, hangers, supports, sleeves and other attachments to the substrate are placed by others prior to the application of spray-applied fire resistive materials.
   2. Beginning of installation means acceptance of existing substrate and project conditions.
B. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.2 PREPARATION
A. Close and seal ductwork in areas where fireproofing is being applied.
B. Provide temporary enclosures to prevent spray from contaminating air.
C. Protection of In-situ Conditions: Protect adjacent surfaces and equipment from damage by overspray and dusting. Mask adjacent work as required. Clean, or repair all existing materials which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Existing materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work to match existing.
D. Surface Preparation:
   1. Clean substrate of dirt, dust, grease, oil, loose material, or other matter which may affect bond of fireproofing.
   2. Remove incompatible materials which affect bond by scraping, brushing, scrubbing, or sandblasting. Repair or replace any work so damaged and soiled.

3.3 MIXING AND APPLICATION
A. Mixing shall conform to manufacturer's written instructions.
B. Materials and equipment shall be as approved by the materials manufacturer. Application shall be by licensed manufacturer's applicators. Procedures shall be in strict accordance with said manufacturer's directions and specifications. Only experienced, skilled mechanics approved by the materials manufacturer shall be allowed to place the materials. A qualified manufacturer's representative shall be present for initial application to guide and assist applicator's personnel.
C. Work shall comply with applicable UL standards in addition to the requirements imposed by the applicable laws and codes, for the indicated ratings, including local pollution control regulations.
D. Sprayed-on fireproofing shall be applied in the exact manner described in the certificates submitted to prove compliance with specified protection requirements. The fireproofing applicator shall be responsible for providing a controlled application of fireproofing material so that uniform quantity and thickness is maintained.
E. After completion of fireproofing work, equipment shall be removed and all surrounding wall and floor areas cleaned of deposits of sprayed-on fireproofing materials. Where hangers and other surfaces not requiring fireproofing have been sprayed unavoidably, the sprayed material shall be removed and the surfaces made clean.
3.4 REPAIR
   A. Patch all areas of testing and any area where fireproofing has been damaged or removed during construction.

3.5 FIELD QUALITY CONTROL
   A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.
   B. Ensure that applied fireproofing remains exposed to view until verification inspections and testing is made and approval of applied fireproofing is obtained. All costs for removal and replacement of prematurely installed materials to allow inspection of fireproofing shall be borne by the Contractor.
   C. Inspection and testing shall verify that applied thickness and density meets manufacturer’s tested requirement standards for required fire-resistance ratings.
      1. Where samples fail to meet thickness, quality, or dry density requirements, further sampling and testing will be required in the area of deficient sample. If such further testing indicates a deficient area, correction shall be made by the application of additional material or removal and replacement of faulty material.
   D. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

3.6 CLEANING
   A. Daily clean work areas by sweeping and disposing of debris. Place waste material in suitable bags or containers, and remove from site.
   B. Upon completion of the work of this Section in any given area, clean walls, floors (including bare concrete slabs) and surrounding surfaces of overspray and drippings. Remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.

END OF SECTION
SECTION 078400
FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install fireproof firestopping, firesafing materials, smoke seals and related accessories required for this Project for all penetrations through fire resistance rated construction, including, but not limited to, penetrations for plumbing, fire suppression, heating, ventilating and air conditioning, electrical systems, and specialized equipment.

1. Fire resistance rated construction requiring firestopping includes, but is not limited to rated floors and roofs, rated partitions, smoke barriers, smoke partitions, partitions in rated corridors, passageways and stairs, shaft partitions, shaft wall (vertical and horizontal), area separation fire walls, party wall systems, and temporary fire resistant rated partitions and barriers.

2. Provide removable temporary firestopping (pillows) as required to maintain fire integrity prior to Owner's final acceptance, to permit installation of electrical, telephone, data and sound system wiring. Replace temporary firestopping with permanent, after wiring systems are completed.

B. Furnish and install firestopping/smoke seals at construction joints occurring at tops of fire resistance rated partitions, smoke partitions, and temporary partitions between top of partition and underside of deck above.

C. Furnish and install all firestopping, firesafing, and smoke seals where required by applicable codes and as additionally required by authorities having jurisdiction at no additional cost to the Owner.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - Product Requirements: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - Construction Waste Management and Disposal: Procedural and administrative requirements for construction and demolition recycling.

1.3 REFERENCES

A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - References. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.


1.4 PERFORMANCE REQUIREMENTS

A. Provide materials and work to conform to Building Code Requirements in fire resistant wall assemblies.
B. Manufacturer’s Certified Product Test Requirements:
   1. All firestop/smokeseal material shall be tested by a recognized, independent testing agency and shall conform to both Flame (F-rating) and Temperature (T-rating) requirements of ASTM E814.
   2. Conform to UL Fire Hazard Classification Requirements.
   3. Tested and classified non-combustible per ASTM E84.
C. Firestops in place shall be of sufficient thickness, width, and density to provide a fire resistance rating at least equal to the wall, or partition construction into which it is installed.
D. Non-Combustible Dams: Construct non-combustible dams:
   1. As necessary to achieve fire rating as tested and rated.
   2. In conformance with installation requirements for type of wall, and partition construction.
   3. As recommended by firestop/smokeseal manufacturer.
E. Combustible damming materials, if used, must be removed after proper curing.
1.5 SUBMITTALS
   A. See Section 013000 - Administrative Requirements, for submittal procedures.
      1. Product Data: Manufacturer’s product data sheets, specifications, performance data, and physical properties.
         a. Indicate requirements for manufacturer’s descriptive data for products and related materials with FM, UL or Warnock-Hersey illustrations showing systems and approval of materials in systems.
      2. Certificates: Manufacturer’s written certification stating that firestopping materials, meet or exceed the requirements specified under this Section and that all fire-resistive requirements for the indicated combustibility, Flame (F-rating) and Temperature (T-rating) Ratings have been met.
      3. Manufacturer’s installation instructions.
      4. Test Reports: Submit fire test reports from recognized, independent testing agent(s) indicating the following:
         a. Fire test report of firestop material applied to substrate and penetration materials similar to project conditions. Tests to indicate both Flame (F-rating) and Temperature (T-rating) Ratings.
         b. Test reports of products to be used shall indicate conformance to ASTM E-814.
         c. Include test report for each type and quantity of penetrant through each type of wall or floor construction.
      5. On-Site Sample Installation to be Included in Work: Minimum (15) fifteen days prior to application in any area, provide samples of firestop and smokeseal materials and installation in accordance with the following requirements.
         a. Apply one sample of appropriate firestop and smokeseal material for each different penetration and fire rating required for the work.
         b. Sample areas will comply with thickness, fire resistance ratings, and finished appearance of the project and applicable fire code.
         c. Acceptance samples will constitute standard of acceptance for method of application, thickness, and finished appearance for firestop and smokeseal application. The sample(s) shall remain visible during completion of the work and shall remain as part of the completed work.
      6. Shop drawings indicating requirements for penetrations in wall/deck intersections, change of planes, control joints, expansion joints and blank openings.
1.6 QUALITY ASSURANCE
   A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
   B. Sole Source: Obtain firestop and smokeseal products from a single manufacturer, except as otherwise approved by the Architect.
C. Environmental Requirements for Volatile Chemicals: Use firestopping caulks that comply with the following limits for VOC content:
   1. Firestopping caulks: VOC not more than 250 g/L.

D. Qualifications:
   1. Installer: a specialized subcontractor having not less than 3 years documented experience demonstrating previously successful work of the type specified herein.
      a. The manufacturer of the firestop material shall submit written certification that the firm to be used for the firestop products has been trained in the application of the products by the manufacturer.

1.7 MOCK-UPS
   A. Provide mock-ups under provisions of Section 014000 - Quality Requirements for purpose of verifying quality of firestop installation.
   B. Provide firestop samples and locate as directed. Accepted samples may remain as part of the work.

1.8 DELIVERY, STORAGE AND HANDLING
   A. Deliver and store firestopping materials in original, sealed, packages showing manufacturer’s identification and date of packaging.
   B. Store and handle materials following manufacturer’s recommended procedures, and in accordance with material safety data sheets.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following, or approved equal:
      1. Specified Technologies, Inc., Fort Lauderdale, FL.
      2. Bio Fireshield (A division of Rectroseal), Houston, TX.
      3. Dow Corning Corporation, Midland, MI.
      4. Hilti, Inc., Tulsa, OK.
      5. 3M Fire Protection Products, St. Paul, MN.
      7. Metacaulk, (A Division of Rectroseal), Houston, TX.
      8. Tremco, Inc., Beachwood, OH.

2.2 REGULATORY REQUIREMENTS
   A. Conform to applicable code for fire resistance ratings and surface burning characteristics.
   B. Obtain certificate of compliance from authority having jurisdiction indicating approval of combustibility.

2.3 MATERIALS
   A. Furnish and install fire rated, through-wall cable raceways equal to Specified Technologies, Inc., product: “E-Z PATH”, consisting of the following:
      1. Shell composition: 0.059 inch galvanized steel.
      2. Cable loading area: 6 square inches, (nominal).
      3. Allowable cable fill: 100 percent visual.
      4. Fire resistance ratings: 1 and 2 hour.
      7. Sample cable volume: (CAT 5): 120 (nominal).
      8. In-service temperature: 120° F (49° C).
B. Firestop Mortar: Asbestos free, cementitious mortar, U.L. classified as a “fill, void, or cavity material” for through penetration firestop system when tested in accordance with ASTM E814/UL1479.
   1. Acceptable products, or approved equal:
      a. Bio Fireshield, product “Novasit K-10”.
      c. Tremco Inc., product “Tremstop M”.

C. Silicone Firestop Sealant: Single component, non-combustible silicone elastomer firestop sealant, U.L. classified as a “fill, void, or cavity material” for through penetration firestop system when tested in accordance with ASTM E814/UL1479.
   1. Acceptable products, or approved equal:
      a. Bio Fireshield, product “Biotherm 100” (Gun Grade) or “Biotherm 200” (Self Leveling).
      b. Specified Technologies, Inc., product “Spec Seal Pensil 300 Sealant (gun grade)” or “Spec Seal Pensil 300SL” (Self Leveling).
      c. 3M Company, product “Fire Barrier Silicone Sealants”.
      d. Tremco Inc., product “Tremsil” (Gun Grade) or “Tremsil S/L” (Self Leveling).
   2. Sealants will not dissolve in water.

D. Intumescent Firestop Sealant and Caulks: Acrylic based, water resistant sealant, which will not re-emulsify after drying.
   1. Acceptable products, or approved equal:
      a. Bio Fireshield, product “Biostop 500”.
      b. Specified Technologies, Inc., product “Spec Seal Triple-S Sealant”.
      c. 3M Company, product “Fire Barrier Caulk CP25WB+”.
      d. Tremco Inc., product “Tremstop 1A”.

E. Firestop Putty: Sticks or pads.
   1. Acceptable products, or approved equal:
      a. Bio Fireshield, product “Moldable Putty”.
      c. 3M Company, product “Fire Barrier Moldable Putty”.
      d. Tremco Inc., product “Flowable Putty”.

F. Firestop Collars: Pre-manufactured fire protective pipe sleeve, UL classified as “fill, void, or cavity material” for through penetration firestop system when tested in accordance with ASTM E814/UL1479.
   1. Provide separated (two piece) firestop collar for application when plastic pipe system is already in place. Provide non-separated firestop collar for application prior to installation of plastic pipe system.
   2. Acceptable products, or approved equal:
      a. 3M Company, Inc., product “Fireshield Firestop Sleeve”.
      c. 3M Company, product “Fire Barrier PPD’s”.
      d. Tremco Inc., product “Fyrecan sleeve”.

G. Firestop Pillows: UL Classified as “fill, void, or cavity material” for through penetration firestop system when tested in accordance with ASTM E814/UL1479.
   1. Acceptable products, or approved equal:
      a. Bio Fireshield, product “Fireshield Firestop Pillows”.
      c. Tremco Inc., product “Tremstop P.S”.

H. Wrap Strips:
   1. Acceptable products, or approved equal:

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b. Specified Technologies, Inc., product “Spec Seal Wrap Strip”.
c. 3M Company, product “Fire Barrier FS195 Wrap Strip”.
d. Tremco Inc., product “Tremco W.S”.

I. Firesafing Insulation: Mineral wool fiber/ceramic wool non-combustible insulation conforming to ASTM C665, Type 1, ASTM C612, and ASTM C553 with a minimum density of 4 pounds per cubic foot.
   1. Flame Spread Classification: Material shall be classified non-combustible per ASTM E814.
   2. Recycled content of slag: Use maximum available percentage of material (slag). Mineral wool insulation products incorporated into the work shall contain not less than 75 percent of recycled material (slag) by weight.
   3. Acceptable products include:
      c. Roxul, Inc., product “Roxul Safe”.
      d. Thermafiber, Inc. product “Safing 4.0 pcf”.
   4. Accessories: Provide galvanized steel safining clips as required for installation of insulation.

J. Elastomeric Firestopping: Non halogenated latex based elastomeric coating applied by airless spray.
   1. Acceptable products, or approved equal:
      b. Bio Fireshield (A Division of Rectroseal), product “Flamesafe FS900+”
      c. Hilti, Inc., product “CP 601S”.

2.4 ACCESSORIES
   A. Forming and damming materials: Mineral fiberboard or other type as recommended by firestopping manufacturer.
   B. Primer, sealant and solvents: As recommended by manufacturer.
   C. Woven wire mesh: Galvanized 20 gage woven wire mesh “chicken wire” or “poultry fencing”, 1 inch spacing.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verification of Conditions: Inspect areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Beginning of installation means acceptance of existing substrate and project conditions.

3.2 PREPARATION
   A. Surface to receive firestops shall be free of dirt, dust, grease, oil, form release agents, or other matter that would impair the bond of the firestop material to the substrate or penetrating item(s).
   B. Voids and cracks in substrate shall be filled and unnecessary projection removed prior to installation of firestops.
   C. All penetrating items shall be permanently installed prior to firestop installation.
   D. Substrate shall be frost, free and, when applicable, dry.

3.3 INSTALLATION
   A. General
1. Installation of firestops shall be performed by applicators/installers qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations. Meet building code requirements.

3. Coordinate with plumbing, mechanical, electrical, and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestops.
   a. Ensure that all firestopping is inspected prior to installation of suspended ceilings or concealed by other finished materials.

B. Dam Construction:
   1. Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming material may be left as a permanent component of the firestop system.
   2. Placement of dams shall not interfere with function or adversely affect the appearance of adjacent construction.

C. Installation of Single Component Silicone Firestop:
   1. Apply with manual or powered caulking gun.
   2. Apply minimum 1/2 inch thickness for 2 hour rating. Apply 1/2 inch to both sides of wall penetrations.
   3. Use incombustible insulation as required to achieve fire resistance rating.
   4. Surface of gun grade silicone firestop may be tooled using clean, potable water.
   5. Clean excess material off of adjacent surfaces and tools within 10 minutes using either water or Xylol where the use of such would not be hazardous.

D. Installation of Cementitious Firestop Mortar:
   1. Add dry powder to water and mix with mechanical mixer or hand mixing tools as recommended by firestop mortar manufacturer. Allow a average mixing time is 3 minutes and provide a average wet density of 70 pounds per cubic foot, plus or minus 5 PCF.
   2. Do not apply if ambient or substrate temperature is less than 35 degrees Fahrenheit during 24 hours after application.
   3. Wet all surfaces prior to application of firestop mortar.
   4. Mortar may be hand applied or pumped into the opening.
   5. Exposed surfaces shall be finished using conventional plastering tools prior to curing.
   6. When installation around layered cables, it is recommended to increase the fluidity of the firestop mortar to provide a better fill around the cables. Vibrate or move the cables slightly to prevent voids from forming between the cables.
   7. Allow 48 hours for initial cure prior to form removal. For full cure allow 27 days.
   8. Wet material may be cleaned with water. Dry material may require scraping or chipping.

E. Installation of Firestop Collars, (Plastic Pipe Only):
   1. Firestop collars may be surface mounted to a slab or wall or imbedded in Firestop Mortar to a maximum depth of 2 inches.
   2. For wall penetrations with ABS pipe firestop collars must be installed on both sides of the penetration to provide a 2 hour F and T Rating. All other applications required installation on one side only to provide a 2 hour F and T Rating.

F. Installation of Firesafing Insulation:
   1. Install firestopping safing insulation on safing clips spaced as needed between each stud, leaving no voids. Secure safing clips to slab using fasteners recommended by insulation manufacturer. Install sealant over mineral wool in accordance with test requirements.
G. Conclusion of Work Day: Wherever work is performed in areas which abut or are adjacent to Owner occupied areas, at the conclusion of the work day ensure that all penetrations and perimeter construction joints are firestopped and that there are no openings, penetrations or construction joints left unprotected.

H. Firestopping for cabling shall use through wall or through floor adjustable fire rated pathway device equal to Specified Technologies, Inc. “EZ-PATH - Series 44”.

3.4 LABELING
A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems.
   1. Include the following information on labels:
      WARNING: Through-Penetration Firestop System-Do Not Disturb.
      Notify Facility Manager of Any Damage.
      - Contractor's name, address, and phone number.
      - Through-penetration firestop systems designation of applicable testing and inspecting agency.
      - Date of installation.
      - Through-penetration firestop systems manufacturer's name.
      - Installer's name.

3.5 FIELD QUALITY CONTROL
A. Inspector: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
   1. Inspector will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.6 SCHEDULE
A. General: Typical penetrations are indicated below with list of standard firestopping/smokeseal approaches. Actual firestopping materials and combination of materials will vary with size of penetration and with individual firestopping manufacturer’s approved UL Design System Requirements. Use only UL Design System materials for each penetration that best matches type of wall construction, i.e., steel stud/gypsum board or masonry/concrete.
   1. Where penetrations occur for which no listed UL or WH Design System test exists, obtain from the firestop system manufacturer an engineered system acceptable to the authorities having jurisdiction for firestopping such penetrations. Engineered system from manufacturer shall include a detail drawing showing the engineered system and shall contain no disclaimers.

B. Single metal pipe (non-insulated) and conduit penetrations through walls:
   1. Masonry and concrete walls only: Firestop mortar and putty.
   2. Intumescent firestop sealant over firesafing insulation.
   3. Intumescent firestop sealant with wrap strips.

C. Multiple metal pipe and conduit penetrations through walls:
   1. Firestop mortar and putty.
   2. Through masonry walls only: Firestop pillows with woven wire mesh.
   3. Silicone Firestop sealant over firesafing insulation.

D. Insulated metal pipe penetrations (single and multiple) through walls:
1. Firestop mortar with wrap strips.
2. Intumescent firestop sealant over firesafing insulation.
3. Intumescent firestop sealant over firesafing insulation and Wrap strips.
4. Multiple penetrations through masonry walls only: Firestop pillows with woven wire mesh.

E. Duct penetrations through walls:
   1. Rectangular and square ducts: Intumescent firestop sealant over firesafing insulation, and steel flanges provided by duct installer.
   2. Round ducts: Intumescent firestop sealant over firesafing insulation.

F. Combustible plastic pipe and conduit penetrations through walls:
   1. Intumescent firestop sealant over firesafing insulation.
   2. Intumescent firestop sealant with firestop collars.

G. Cable penetrations through walls:
   1. Silicone firestop sealant over firesafing insulation.
   2. Intumescent firestop sealant over firesafing insulation.
   5. Firestop putty over firesafing insulation.

H. Cable tray penetrations:
   1. Floors only: Firestop mortar.
   2. Firestop pillows with woven wire mesh containment, and Firestop putty, sticks or pads for filling voids.
   3. Firestop pillows with woven wire mesh containment, and Firestop mortar at perimeter and firestop putty, sticks or pads for filling voids.

I. Blank openings:
   1. Firestop mortar.
   2. Silicone firestop sealant over firesafing insulation.

J. Fire rated joints:
   1. Silicone firestop sealant over backer rod or bond breaker.

K. Floor to curtain wall assemblies:
   1. Silicone firestop sealant/mastic over firesafing insulation.

L. Construction joints at head of wall/floor assemblies:
   1. Silicone firestop sealant/mastic over firesafing insulation.
   2. Elastomeric spray over firesafing insulation.

M. Smoke barrier sealant for dampers, fire door frames:
   1. Silicone firestop sealant.

N. Temporary sealing of openings and penetrations:
   1. Firestop putty, sticks or pads.
   2. Firestop pillows.

3.7 CLEANING

A. Clean adjacent surfaces of firestopping materials.

END OF SECTION
SECTION 079200
JOINT SEALANTS

PART 1 - GENERAL
1.1 SUMMARY
A. General: The work of this Section consists of sealants and backing materials where shown on the Drawings, as specified herein, and as required for a complete and proper installation.
   1. This Section specifies general requirements, definition of joint sealer types, and application requirements for sealant work specified within other individual specification sections.
B. Prepare sealant substrate surfaces, including removal of existing sealant and backing, and thorough cleaning of joints.
C. Furnish and install sealant and backing materials.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

1.3 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
   1. Product Data: Manufacturer's product data sheets, specifications, performance data, chemical and physical properties and installation instructions for each item furnished hereunder.
   2. Selection Samples: Sample card indicating Manufacturer's full range of colors.
   3. Verification Samples: 12 inch long samples of sealant for verification of color, installed where directed by Architect.
   4. Certificates: Manufacturer's certification that the Products supplied meet or exceed specified requirements.
   5. Test and Evaluation Reports:
      a. Compatibility and adhesion test reports: Test reports from sealant manufacturer indicating that sealant proposed for use have been tested for compatibility and adhesion with actual samples of substrates to be used on this project. Include sealant manufacturer's interpretation of test results, and recommendations for primers and substrate preparation specific to this Project.
B. Closeout Submittals: Submit the following under provisions of Section 017800 - Closeout Submittals.

1.4 QUALITY ASSURANCE
A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
B. Sole Source: Provide sealants from a single manufacturer for all work of this Section to the greatest extent possible. Each individual type of sealant installed in the Work shall be from a single manufacturer.
C. Qualifications:
   1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.
1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
   B. Store products in weather protected environment, away from direct sunlight, clear of ground and moisture.

1.6 FIELD CONDITIONS
   A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.7 WARRANTY
   A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a five year period after Date of Substantial Completion.
   C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Silicone Sealants:
   B. Polyurethane Sealants:
   C. Acrylic Sealants (ASTM C920):
   D. Butyl Sealants:
   E. Acrylic Emulsion Latex Sealants:
   F. Preformed Compressible Foam Sealers:

2.2 SEALANTS
   A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
   B. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
      1. Color: To be selected by Architect from manufacturer's standard range.
      2. Applications: Use for:
         a. Interior wall and ceiling control joints.
b. Joints between door and window frames and wall surfaces.
c. Other interior joints for which no other type of sealant is indicated.

C. Security sealant: Tamper and Pick Proof Sealant:

D. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

E. Acoustical Sealant for Concealed Locations:
   1. Applications: Use for concealed locations only:
      a. Sealant bead between top stud runner and structure and between bottom stud track and floor.


2.3 ACCESSORIES
A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify that joints are ready to receive work.
B. Verify that backing materials are compatible with sealants.

3.2 PREPARATION
A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION
A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Perform acoustical sealant application work in accordance with ASTM C919.
D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
E. Install bond breaker backing tape where backer rod cannot be used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
H. Tool joints concave.
   I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch (3 to 6 mm) below adjoining surface.

3.4 CLEANING
   A. Clean adjacent soiled surfaces.

3.5 PROTECTION
   A. Protect sealants until cured.

END OF SECTION
SECTION 081213
HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Furnish the following products to be installed under the designated Sections:
   1. Hollow metal frames, UL-Labeled and non-labeled, complete with internal reinforcing;
      installed under Section 061000 - ROUGH CARPENTRY.

1.2 RELATED REQUIREMENTS
A. Section 061000 - ROUGH CARPENTRY:
   1. Wood blocking, and nailers.
   2. Installation of hollow metal door frames.
B. Section 062000 - FINISH CARPENTRY: Installation of doors and hardware.
C. Section 079200 - JOINT SEALANTS: Requirements for sealants and backing materials.
D. Section 092900 - GYPSUM BOARD: Gypsum grout fill for hollow metal frames occurring in
   gypsum drywall assemblies.
E. Section 099100 - PAINTING: Applied finish coatings.
F. Building-in of frame anchors to wall and partition construction: By trade responsible for wall and
   partition erection.

1.3 REFERENCES
A. Reference Standards: Comply with applicable requirements of the following standards and
   those others referenced in this Section, under the provisions of Section 014200 -
   REFERENCES. Where these standards conflict with other specified requirements, the most
   restrictive requirements shall govern.
   1. ANSI A 117.1 - Specifications for Making Buildings and Facilities Accessible to and
      Usable by Physically Handicapped People.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for
      Steel Doors, Frames, Frame Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.8 - R2008 (formerly SDI 100) - Recommended Specifications for Standard
      Steel Doors and Frames.
   4. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   5. SDI 111 Series (111A-111F): Recommended Details, Steel Doors and Frames.
   7. NFPA publication 80 - Fire Doors and Windows.
   8. NFPA publication 105 - Standard for the Installation of Smoke Door Assemblies.
   9. UL publication 10B - Fire Tests of Door Assemblies.
   10. UL publication 10C - Positive Pressure Fire Tests of Door Assemblies.
   11. UL 1784 - Air Leakage Tests of Door Assemblies.
   12. All applicable federal, state and municipal codes, laws and regulations for exits.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. General: Coordinate the work of this Section with the respective trades responsible for
      installing anchorages furnished by this Section; make arrangements for delivery, receipt
      and installation of inserts and anchorages to prevent delay of the Work.
   2. Coordinate the work of this Section with the respective trades responsible for furnishing
      hardware and installing frames.
   3. Ensure that the work performed hereunder is coordinated with issued templates
      authorized by the hardware supplier.
4. Do not fabricate frames before receiving a copy of the approved hardware schedule, submitted by the hardware supplier, reviewed by the Contractor and accepted by the Architect. Verify that issued templates are coordinated with the approved schedule; immediately notify the Architect, in writing, of any conflicts.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer's product data sheets, specifications, for frames and shop applied finishes.
   2. Shop Drawings:
   3. Door and Frame Schedule: A complete schedule coordinated with the door and frame schedule contained in the Contract Drawings.
   4. Certificates: Manufacturer's written certification stating that doors, frames, and all related items to be furnished hereunder, meet or exceed the requirements specified under this Section; that specified galvanized and shop priming has been performed; and that all U.L. fire-resistive requirements for the indicated Labels have been met.

B. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

1.6 QUALITY ASSURANCE

A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

B. Sole Source: Obtain frames specified in this Section from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Prior to shipping, identify each frame with a removable metal or plastic label which corresponds with door schedule identifying opening number and location.
   2. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
   3. Deliver frames boxed or crated to provide protection during transit and job storage.
   4. Inspect frames upon delivery for damage. Minor damage may be repaired provided the refinished items are equal in respects to new work and acceptable to the Architect; otherwise remove and replace damaged items.

B. Storage and Handling Requirements:
   1. Store and handle materials following manufacturer’s recommended procedures.
   2. Store frames at the building site upright and under cover. Place the units on wood dunnage and cover in a manner that will prevent rust and damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Amweld Building Products, Inc., (A Division of Amweld International, LLC), Coppell, TX.
   2. Ceco Door Products (A Division of Assa Abloy Group Company), Milan, TN.
   3. Curries Company (A Division of Assa Abloy Group Company), Mason City, IA.
   4. Republic Doors and Frames, McKenzie, TN.
   5. Steelcraft (A Division of Ingersoll-Rand Company), Cincinnati, OH.

2.2 DESCRIPTION

A. Regulatory Requirements:
   1. Fire rated door construction shall conform to UL publications 10B and 10C.
   2. Install fire rated door assemblies in compliance with NFPA 80.
2.3 FABRICATION
   A. General: Do not fabricate materials until all specified submittals have been submitted to, and
      approved by, the Architect.
   B. Fabrication Tolerances, Maximum variation for frames: Maximum diagonal distortion 1/16 inch
      measured with straight edge, corner to corner.

2.4 FINISHES
   A. Preparation: Pressure-sand all surfaces of all frames, accessory items, anchors, and related
      items, to remove blemishes and foreign matter and provide paint grip. Spot-fill imperfections
      with metallic filler, and sand smooth. Thoroughly clean the surfaces by applying hot or cold
      phosphate treatment standard with the manufacturer.
   B. Following cleaning apply one dip or spray coat of rust-inhibitive metallic oxide, zinc chromate,
      or synthetic resin primer to all surfaces, including those which will be concealed after erection.
      Bake, or oven dry, the primer at time and temperature recommended by the manufacturer for
      developing maximum hardness and resistance to abrasion.

2.5 ACCESSORIES
   A. Removable Stops: Rolled steel channel shape.
   B. Primer: ANSI A250.10 rust inhibitive type.

PART 3 - EXECUTION
3.1 ERECTION AND INSTALLATION
   A. Installation of frames, including all accessories and related items furnished hereunder, will be
      performed under Section 061000 - ROUGH CARPENTRY, and Section 062000 - FINISH
      CARPENTRY.
   B. Section 061000 - ROUGH CARPENTRY shall place frames in correct position within specified
      tolerances, and provide temporary bracing at locations where frames are indicated to be
      built-into masonry. Section 042000 - UNIT MASONRY shall build and grout frames into
      masonry work.
   C. Final installation of loosely-attached glazing stops will be performed under Section 088000 -
      GLAZING.

END OF SECTION
SECTION 081416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush solid core wood doors, complete with necessary blocking, hardware cut-outs; and provided with openings for glazing where so indicated, for installation under: Section 062000 - FINISH CARPENTRY.

B. Wood glazing beads, loosely attached to glazing cut-outs in doors for removal and permanent installation under: Section 088000 - GLAZING.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

1.3 SUBMITTALS

A. Submit the following under provisions of Section 013000 - Administrative Requirements:

1. Literature: Fabricator’s product data sheets, specifications, and performance data.

2. Certificates: Wood products lacking acceptable documentation for the following will be rejected and their removal required.
   a. General: Fabricator’s written certification stating that doors, meet or exceed the requirements specified under this Section; that specified shop finishing has been performed; and that all fire-resistive requirements for the indicated Labels have been met.
   b. Provide signed certification by agent of door manufacturer stating that machining, glazing and finishing of doors shall be performed by only by the manufacturer in its facilities.
   c. Composite Wood and Agrifiber Products: Include certification indicating compliance with the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda for all composite wood and agrifiber products.

3. Door Schedule: All doors specified under this Section, coordinated with the schedule contained in the Contract Drawings.
   a. Indicate doors to be factory finished and finish requirements.
   b. Indicate fire protection ratings for fire rated doors.

4. Shop Drawings: Elevations, and large scale sections and details of door construction, indicating profiles, core construction, joinery, edges, and cut-outs for hardware and glazing.
   a. Indicate dimensions and locations of mortises and holes for hardware.
   b. Indicate dimensions and locations of cutouts.
   c. Indicate requirements for veneer matching.

5. Verification samples:
   a. Corner section of specified flush type door, showing core construction and joinery.
   b. For transparent finishes: submit two 8 by 10 inch mounted finished samples of each species of veneer specified.
   c. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

FLUSH WOOD DOORS
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6. Submit complete record submittal at end of project, showing all changes made during project.

1.4 QUALITY ASSURANCE
   A. All materials and workmanship shall conform in all respects to the specified grades of the Window and Door Manufacturer’s Association (WDMA) Industry Standard IS 1-A-97, except as modified herein.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Package, deliver and store doors in accordance with specified quality standard.
   B. Accept doors on site in manufacturer’s packaging. Inspect for damage.

1.6 WARRANTY
   A. Provide the following warranties under provisions of Section 017800 - Closeout Submittals. Warranties shall include delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction, all as defined by AWI Quality Standards.
      1. Warranty length:
         a. Interior doors: Manufacturer’s lifetime warranty.
      2. Warranty coverage shall include all labor and material costs of delivery, re-hanging, re-finishing, glass and glazing to produce a complete installation of replaced or repaired doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      1. Algoma Hardwoods, Inc., Algoma, WI.
      2. Marshfield DoorSystems™, Inc., Marshfield, WI.
      3. Eggers Industries, Architectural Door Division, Two Rivers, WI.
      4. Lambton Doors, Lambton Quebec, Canada.
      5. Oshkosh Door Company, Oshkosh, WI.
      6. VT Industries Inc., Holstein, IA.

2.2 GENERAL REQUIREMENTS
   A. Conform to the requirements set forth in the designated Sections of the (WDMA) Industry Standard IS 1-A-97, and the applicable requirements of U.S. Commercial Standard CS 171, as amended. Refer to the Drawings for sizes, locations of each type door, glazing cut-outs in doors, and other characteristics of doors to be furnished hereunder.
      1. Door Grade: Premium.
      2. Door Facing:
         a. Face veneer, to receive stained transparent finish that shall match Architect’s control sample: WDMA Industry Standard, “A’ Grade veneer minimum 1/50 inch (0.6 mm) thick, mechanically sliced. Wood species shall be American Beech (Fagus grandifolia), plain sliced, AWI Premium Grade (as installed).
         b. Crossbanding: Hardwood veneer or composite product at least 1/16 inch thick.
      3. Acoustical seals shall be provided at all (4) edges of doors, as noted in the Door Schedule.

2.3 FIRE-RESISTANCE RATED 45, 60 AND 90 MINUTE LABEL DOORS
      1. Door thickness: 1-3/4 inches, unless indicated otherwise.
      2. WDMA Specification Descriptions.
a. 90 minute "B" label doors: Type "FD-90 MIN-5, HPDL".
b. 60 minute label doors: Type "FD-60 MIN-5, HPDL".
c. 45 minute "C" label doors: Type "FD-45 MIN-5, HPDL".

B. Door Facing: As specified herein above under Article 2.2 - GENERAL REQUIREMENTS.

C. Core Construction:
   1. Core: Non-combustible mineral sections.
   2. Stiles: multiple-ply stiles with 1/4 inch solid hardwood outer ply matching face veneers for species and color.
   3. Top and bottom rails: Maple, birch, Structural Composite Lumber (SCL) or UL approved composite material to meet label requirements.
   4. Blocking: Provide blocking as required to meet WDMA Extra Heavy Duty performance for securing surface applied hardware without the use of through bolts.
      a. For doors scheduled to receive screw-mounted surface closers, provide top rail blocking.
      b. For doors scheduled to receive surface mounted fire exit devices or vertical rods, provide top, intermediate and bottom rail blocking for screw mounting.
      c. Provide additional blocking for all other surface mounted hardware.

D. Adhesives:
   1. Face assembly: Type I (waterproof).
   2. Core assembly: Type II (water resistant).

2.4 NON-RATED AND 20 MINUTE RATED SOLID-CORE DOORS

A. General Construction: WDMA Industry Standard I.S. 1-A-97, S-9 Veneer, Particleboard Core Bonded, Premium Grade Door.
   1. WDMA Specification Description: “PC-5”.
   2. Door thickness: 1-3/4 inches, unless indicated otherwise.

B. Door Facing: As specified herein above under Article - “Flush Faced Doors”.

C. Core Construction:
   1. Core: Particleboard complying with ANSI A208.1 Type 1, Grade 1-LD-2 having a density of 33 pounds per cubic foot.
      a. Provide only formaldehyde free particleboard, equal to Rodman Industries, Oconomowoc, WI. Furnish certification of formaldehyde free products.
   2. Stiles: Laminated strand lumber or hardwood mill option for inner ply of stiles, continuously bonded to core with adhesives and abrasively planed before veneering, minimum of 1-3/8 inches after trimming, with 1/4 inch solid hardwood outer ply matching face veneer, or visually compatible hardwood species.
   3. Top and bottom rails: Maple, Birch, Structural Composite Lumber (SCL) or UL approved composite material to meet label requirements, minimum 1-1/8 inch width.

D. Adhesives: Type 1 (waterproof) for both face and core assembly.

2.5 GLAZING BEADS

A. Glazing beads for “B” and “C” fire rated doors, wood veneered bead:
   1. Algoma’s style number W-9, labeled, with 1/2 inch sight line.
   2. Eggers #100 style.
   4. V-T type VT1F.

B. Glazing beads for 20 minute rated and non-fire rated doors:
   1. Algoma’s style number W-4 wood bead with 3/8 inch sight line.
   2. Eggers style number 100, 5/8 inch sight line.
   3. Marshfield DoorSystems style number W-6, 3/8 inch sight line.
2.6 FABRICATION

A. Fabricate doors in accordance with specified manufacturer’s requirements. Fabricated rated doors in compliance with WHI, or UL requirements as appropriate.

B. Laminate door facing, cross banding and assembled core in a hot press.

C. Bond stiles and rails to cores, sand for uniform thickness. Factory sand assembled door leaf.

D. Factory-machine doors to receive hardware from templates furnished under Section 087100 - DOOR HARDWARE, or as indicated on the Drawings. Do not machine for surface hardware.
   1. Provide inner blocks at lock edge and top of door for closer hardware reinforcement.

E. Factory fabricate doors for undercut where scheduled.

F. Factory cut all glazed openings as scheduled. Field cutting of openings is prohibited.

G. Fabrication tolerances: Maximum diagonal distortion (warp): 1/4 inch (6 mm) measured with straight edge from corner to corner over a maximum 42 by 84 inch surface area.

2.7 FACTORY FINISHING

A. General: Factory finish to be comply with EPA Title 5 guidelines for Volatile Organic Compound (VOC) emissions limitations.

B. Transparent finish: AWI Premium Grade Factory Finish System 9, having ultraviolet (UV) cured polyurethane sealer and topcoat, with a satin sheen of 31° to 35° gloss units per ASTM D523.
   1. Finish system shall include the following:
      a. Finish sanding.
      b. Sealer application - first coat.
      c. Sealer gel cure.
      d. Sealer application - second coat.
      e. Sealer gel cure.
      f. Sealer application - third coat.
      g. Sealer full cure.
      h. Sealer sanding.
      i. Topcoat application - first coat.
      j. Topcoat application - second coat.
      k. Topcoat full cure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Installation of wood doors, including all accessories and related items furnished hereunder, will be performed under Section 062000 - FINISH CARPENTRY.

B. Final installation of loosely-attached glazing stops will be performed under Section 088000 - GLAZING.

END OF SECTION
SECTION 083100
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Gypsum board inlay access panels.
B. Wall and ceiling access door and frame units.
C. Tiled wall inlay access panels.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling
D. Section 092900 - GYPSUM BOARD: Openings in GWB partitions and ceilings.
E. Section 099100 - PAINTING: Field-applied finish.

1.3 REFERENCE STANDARDS
A. ITS (DIR) - Directory of Listed Products; current edition.

1.4 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
C. Samples: Submit two access units, 6 by 6 inch (150 by 150 mm) in size illustrating frame configuration.
D. Manufacturer's Installation Instructions: Indicate installation requirements.
E. Project Record Documents: Record actual locations of each access unit.

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
B. Conform to applicable code for fire rated access doors. Provide access doors of fire rating equivalent to the fire rated assembly in which they are to be installed.
C. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION
A. Deliver materials to project site in manufacturer's original, unopened undamaged packaging, with identification labels intact.
B. Store materials in original packaging, protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by the manufacturer.
C. Store materials flat.

1.7 PROJECT CONDITIONS
A. Coordinate the work with other work requiring access doors and the placement of support to receive anchor attachments
B. Coordinate the work with installation of ceiling systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS


2.2 ACCESS PANELS - FOR FIRE RESISTANCE RATED CONSTRUCTION

A. For fire-resistance rated wall and ceiling surfaces: Standard flush panel door meeting the following requirements:
   1. Panel and frame rating: UL “B” label for 90 minutes.
   2. Frame type:
      a. For ceramic tile walls: 16 gage Type 304 stainless steel flanged frame, with flange exposed to view 1 inch or less, equal to:
         1) Acudor FW-5050 series
         2) Karp KRP-150FR series.
         3) Nystrom IT series.
         4) Williams WB-FRSS Regular series.
      b. For gypsum board walls and ceilings: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.
         1) Acudor FW-5050DW
         2) Karp KRP-350FR series.
         3) Nystrom IW series.
         4) Williams WB-FR series.
   3. Door: Insulated flush panel door as follows:
      a. Typical wall types: Flush door, sandwich construction with 2 inch thick mineral wool fiber insulation between two layers of 20 gage galvanized bonderized steel.
      b. For ceramic tile walls only: Flush door, sandwich construction with 2 inch thick mineral wool fiber insulation between two layers of 20 gage Type 304 stainless steel.
   4. Hinge: Flush continuous piano hinge with stainless steel pin.
   5. Closer: Spring closer.
   6. Latch/lock: Latch bolt operated by (factory prepared to receive, site installed) 1-1/8 inch mortise cylinder lock.

B. For fire-resistance rated wall surfaces: Medium security type, with flush panel door meeting the following requirements:
   1. Panel and frame rating: UL “B” label for 90 minutes.
   2. Frame type:
      a. For gypsum board and veneer plastered walls and ceilings: 14 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead, equal to
         1) Acudor FW-5050DW
         2) Karp KRP-350FR series.
         3) Nystrom IW series.
         4) Williams WB-FR series.

2.3 ACCESS PANELS - FOR NON- RATED CONSTRUCTION

A. For non-rated wall and ceiling surfaces (service and non-public areas): Flush panel door type meeting the following requirements:
   1. Frame type:
      a. For tiled walls: 16 gage Type 304 stainless steel flanged frame, with flange exposed to view 1 inch or less, equal to:
         1) Acudor UF-5000 series.
         2) Karp DSC-214SM series.
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2. Door: Flush panel door as follows:
   a. Typical all wall types, except tile: 14 gage galvanized bonderized steel.
   b. For tiled walls: 14 gage type 304 stainless steel.

3. Hinge:
   a. Typical: Concealed spring hinge enabling door to open 175 degrees and permit removal of door from frame.
   b. Panels greater than 24 by 36 inches: Flush continuous piano hinge with stainless steel pin.

4. Latch/lock: Latch bolt operated by (factory prepared to receive, site installed) 1-1/8 inch mortise cylinder lock.

B. For non-rated gypsum board walls and ceilings (Public areas): Recessed door type meeting the following requirements:
   1. Manufacturer’s types:
      a. Acudor DW-5015 series.
      b. Karp:
         1) Walls: Karp RDW series.
         2) Ceilings: Karp KATR series.
      c. Nystrom RW series.
      d. Williams WB-DW series.
   2. Frame type: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.
   3. Door: Recessed 16 gage galvanized bonderized steel door, with 22 gage galvanized steel drywall bead.
   4. Hinge: Concealed pivot rod hinge.
   5. Latch/lock: Latch bolt operated by (factory prepared to receive, site installed) 1-1/8 inch mortise cylinder lock.

2.4 ACCESSORIES
   A. Emergency latch release: For all ceiling panels and wall panels accessible from the back which are greater than 18 by 18 inches in size, provide an interior latch release mechanism to permit panel to be opened from back (interior side) of panel.

2.5 FACTORY FINISHING
   A. Panel assemblies fabricated from stainless steel: Nº. 4 satin finish.
   B. Panel assemblies fabricated from galvanized bonderized steel: Baked on rust inhibitive gray primer finish.
   C. Panel assemblies fabricated from cold rolled steel: Phosphate dipped with baked on rust inhibitive gray primer finish.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Verify that rough openings are correctly sized and located and proceed with installation only after unsatisfactory conditions have been corrected.
B. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.2 PREPARATION
A. Maintain temperature and humidity range for the time prior to, during and after installation recommended by the product manufacturer.

3.3 INSTALLATION
A. Install units in accordance with manufacturer's instructions.
B. Install frames plumb and level in openings, and secure units rigidly in place.
C. Position units to provide convenient access to concealed equipment when necessary.
D. Comply with manufacturer's written instructions for installing high-security access doors and frames.

3.4 CLEANING
A. Upon completion of installation, clean components and accessories per manufacturer's recommended cleaning methods.

3.5 PROTECTION
A. Protect installed units after installation from damage from construction operations.
B. If damage occurs, remove and replace damaged components or entire unit as required to provide unit in its original, undamaged condition.

END OF SECTION
SECTION 088000
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install the following:
   1. Tempered glass in non-rated hollow metal doors and frames.
   2. Wire-less fire resistant rated glazing in designated rated doors and frames.
   3. All materials required to properly install glass furnished hereunder, including sealant, tapes, setting blocks, and spacers.
   4. Insulating glass units.

B. Work of this section includes installation of glazing beads furnished under related sections.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - Product Requirements: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - Construction Waste Management and Disposal: Procedural and administrative requirements for construction and demolition recycling.

D. Section 079200 - Joint Sealants: Requirements for sealants and backing materials.

1.3 REFERENCE STANDARDS

A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   1. AAMA 804.1 - Ductile Back-Bedding Compound.

B. The following reference materials are hereby made a part of this Section by reference thereto:
   2. SIGMA - Vertical Glazing Guidelines, Number A3000-87.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Field Measurements:
   1. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
   2. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
   1. Product Data:
      a. Product data sheets for fritted glass.
      b. Product data sheets on glazing products: Provide chemical, functional, and environmental characteristics, size limitations, special application requirements. Identify available colors.
      c. Sample Warranty: Provide copies of manufacturers’ actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof.
   2. Shop Drawings: Show sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
      a. Plans and elevations 1/4 inch scale of each type of glazing and mirror assembly; indicate dimensions, and reference details. Verify dimensions with field measurements.
   3. Verification Samples:
      a. 12 x 12 inch piece of fritted glass to obtain design approval from Architect.
      b. 12 x 12 inch pieces of each specified type and thickness of glass, bearing labels indicating locations where each type of glass will be used.
      c. Glazing tape: 12 inch length of specified type and size.
   4. Certificates: Manufacturer’s written certification stating that the materials installed, meet or exceed the requirements specified under this Section.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

C. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
   1. Bonds and Warranty Documentation:
      a. Manufacturer’s Warranties and Guarantees as specified elsewhere herein this Section.

1.6 QUALITY ASSURANCE

   1. Notify the COR and the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

B. Qualifications:
   1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.
   2. Welders Certificates: Utilize only qualified welders employed on the Work. Submit verification that Welder’s are AWS D1.1 and D1.4 qualified within the previous 12 months.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
   2. Deliver materials in labeled, protective packages, when and as required.

B. Storage and Handling Requirements:
   1. Store and handle in strict compliance with manufacturer’s instructions and recommendations of GANA Glazing Manual. Use clean gloves and tools when handling materials, avoid contamination. Use rolling blocks and suction cups to move glass units not in shipping crates.
a. Carefully store materials to avoid overloading any building component or structure.
b. Do not unpack material until it is to be set, unless un-packing is required for inspection by the Architect.

2. Store mirrors and coated glass in a dry place with acid-free paper between glass sheets.
3. Protect factory finished materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.

1.8 SITE CONDITIONS
A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 WARRANTY
A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
B. Manufacturer Warranty/Guarantee: All shall include replacement of defective glass and mirrors, and delivery of replacement glass products furnished f.o.b. from point of manufacturer to project site.
   1. Insulating Glass: Manufacturer's 10 year written guarantee covering insulating glass against defects in materials and workmanship, including failure of seals effective on date of original factory shipment to site.
      a. Provide coverage in Guarantee for manufacturing defects, including failure of hermetic seal of air space (except by glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating or other visual indications of seal failure or performance.
   2. Mirrors: Manufacturer's 5 year written guarantee covering against defects in materials and workmanship of reflective coatings on mirrors and replacement of the same.

PART 2 - PRODUCTS

2.1 GLASS - GENERAL
A. General requirements for glass: Of domestic and foreign manufacture, conforming to the referenced standards and with the additional requirements specified herein; factory labeled on each pane stating the strength, type, thickness and quality; with all labels remaining on glass until final cleaning.
   1. Glass thickness shown and heat treatment specified are minimum requirements. Provide glass thickness and heat treatment as required to meet specified performance criteria, State and local codes and ordinances.

2.2 MANUFACTURERS
A. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   6. Substitutions: Refer to Section 016000 - Product Requirements.
B. Float Glass Manufacturers:
   6. Substitutions: Refer to Section 016000 - Product Requirements.
C. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
   1. Manufacturers:
      2. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.

2.3 GLASS MATERIALS
A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Fully Tempered Safety Glass: Complies with ANSI Z97.1

2.4 GLASS TYPES
A. Glass Type GL-1 - Fully Tempered Safety Glass, clear, 1/4 inch thick.
   1. Glass at non-rated doors and side lites.
      a. Refer to Section 085633 - CLEAN ROOM WINDOWS for glass at Compounding Rooms.

B. Glass Type GL-2: 8mm - 9mm thick (5/16 inch-3/8 inch) transparent wire-less fire rated ceramic glazing material with polished finish.
   1. Glass at rated doors and side lites.
   2. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      c. SAFTI First, “Pyran Platinum L”.
   5. Permanently identify each individual glazing unit with a listing mark visible after installation.
   6. In accordance with manufacturer's specifications, Firelite Plus must be glazed into frames with a similar rating, using silicone glazing compound which shall be supplied with the Firelite Plus material.

2.5 FABRICATION
A. General: Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
B. Fabricate glass as required to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth-ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after heat-tempering.
   1. For non-tempered to be cut at site, provide glass larger than required so as to obtain clean cut edges without seaming or nipping.
C. Fabricate glass with the following edge treatments.
   2. Concealed edges: Cut edges with minimum edge work.
   3. Butt-joint edges: Flat round and finished with edges eased.
2.6 ACCESSORIES

A. Glazing tape: Preformed butyl-polyisobutylene rubber with 100 percent solids contained in extruded tape roll form and complying with AAMA 804.1; coiled on release paper; of sizes required for proper glazing. equal to one of the following:
   1. Protective treatments 3030 or 606.
   2. Tremco Preshimmmed 440.

B. Setting blocks: Neoprene, 80-90 shore A durometer hardness, certified to be “silicone compatible”; sized as follows:
   1. Length: 0.1 inch per square foot of glass, but not less than 4 inches.
   2. Width: equal to glazing rabbet space minus 1/16 inch.
   3. Height to suit glazing method and pane weight and area.

C. Spacers: Neoprene, 60-80 shore A durometer hardness; sized as required.

D. Glazing sealant:
   1. General glazing sealant: One-part medium modulus, neutral curing, synthetic rubber sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, grade NS, Class 25 for uses NT, G and A, FS TT-S-001543A, Type, Class A. Color as selected by the COR and the Architect.
      a. Dow Corning Corporation, Midland MI.; product, “Silicone Glazing Sealant”.
      b. General Electric Company (GE Silicones) Waterford NY.; product, “SilGlaze II SCS2800”.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.7 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of applicable code.
   4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   5. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
   3. To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide glass products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Inspect receiving surfaces and ensure that they are dry and free from dust, or other foreign materials before glazing. Clean all surfaces with cloth saturated with mineral spirits of high-flash naphtha as recommended by glazing tape manufacturer, before glazing.

B. Field Measurements: Verify that field measurements are as indicated on approved Shop Drawings.
   1. Check all openings, prior to glazing, to make certain that the opening is square, plumb and secure in order that uniform face and edge clearances are maintained.
   2. Determine the actual sizes required by measuring the receiving openings. Size glass to permit required clearance and bite around full perimeter of glass, as set forth in the referenced FGMA standards, or as recommended by the glass manufacturer. Do not nip edges, to remove flares or to reduce oversize dimensions, under any circumstance.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Utilize dry glazing methods for field installation of glass in interior doors and frames.
B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (2 mm) above sight line.
C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane.
E. Place glazing tape on free perimeter of glazing in manner as described above.
F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
G. Knife trim protruding tape.

3.3 PROTECTION

A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass.
B. Cover glass To protect it from activities that might abrade the glass surface.

3.4 CLEANING

A. Clean glass surfaces promptly after installation, exercising care to avoid damage to the same. Remove excess glazing tape, labels, dirt, and other contaminants.

END OF SECTION
SECTION 088413
DECORATIVE PLASTIC GLAZING

PART 1 - GENERAL

1.1 SUMMARY
A. Furnish and install decorative plastic glazing including attachment hardware.

1.2 RELATED REQUIREMENTS
A. Section 064000 - ARCHITECTURAL WOODWORK: Casework and workstation construction incorporating decorative plastic glazing.

1.3 REFERENCES
A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES.

1.4 SUBMITTALS
A. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
B. Manufacturer’s installation instructions: Indicate special procedures, perimeter conditions and conditions requiring special attention.
C. Shop drawings: Include 1/4 inch scale elevations and plans. Include large scale design details showing attachment devices, and complete installation details.

PART 2 - PRODUCTS

2.1 MANUFACTURER
A. Specified Manufacturers: To establish a standard of quality, design and function desired, Drawings and specifications have been based on 3-Form, Salt Lake City, UT.

2.2 DECORATIVE PLASTIC GLAZING
A. Product (SF-1A): 3form, “Varia Ecoresin” panels, in sizes as indicated on the Drawings.
1. Thickness: 3/8 inch.
2. Colors: As selected by the Architects from manufacturer’s full range of available options.
3. Flammability:
   a. The exterior and interior faces shall be an approved light transmitting panel with a CC1 fire rating classification per ASTM D-635. Smoke density no greater than 70 per ASTM D2843 and self ignition temperature of 1120 degrees F. per ASTM 1929.
   b. Interior flame spread classification of Class I per ASTM E84.
B. Accessories:
   1. Fastening: Basis of Design: "LevelGlass" floor-to-ceiling partition with top support as detailed on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Installer to examine area of installation to verify readiness of site conditions. Notify general contractor about any defects requiring correction. Do not work until conditions are satisfactory.
3.2 INSTALLATION
   A. Install panels plumb, level and true to line. Align assembly free of warp or twist. Maintain
      assembly dimensional tolerances, aligning with adjacent work where this occurs.
   B. Provide method of attachment to framing to permit sufficient adjustment to accommodate
      construction tolerances and irregularities.

3.3 TOLERANCES
   A. Maximum Variation from Plane: 1/8-inch every 3 feet maximum.
   B. Alignment of Two Adjoining Members Abutting in Plane: Within 0.015 inches.
SECTION 088700
GLAZING SURFACE FILMS

PART 1 - GENERAL

1.1 SUMMARY
A. The work of this Section consists of field-applied glazing films where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following scope.
B. Furnish and install the following: Privacy glazing film.

1.2 REFERENCES
A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   1. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.
   3. ASTM E 308 - Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System.

1.3 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
B. Product Data:
   1. Product data sheets on glazing products: Provide chemical, functional, and environmental characteristics, size limitations, special application requirements. Identify available colors.
   2. Sample Warranty: Provide copies of manufacturers' actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof.
C. Shop Drawings: For custom patterns (as appropriate).
D. Selection Samples: Sets of color chips representing manufacturer's full range of available colors and patterns.
E. Verification Samples: Minimum 12 x 12 inch Samples representing actual product color and opacity.
F. Test and Evaluation Reports: Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
G. Manufacturer's Instructions:
   1. Preparation instructions and recommendations.
   2. Installation methods.
H. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
   1. Bonds and Warranty Documentation:
      a. Manufacturer’s Warranties and Guarantees as specified elsewhere herein this Section.
1.4 QUALITY ASSURANCE
   A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
   B. Qualifications:
      1. Installer/Applicator: Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

1.5 FIELD-SAMPLE / MOCK-UP
   A. Provide field sample / mock-up(s) under provisions of Section 014000 - QUALITY REQUIREMENTS.
   B. Provide mock-up using selected film types, minimum 16 square feet, illustrating color, texture and finish, and demonstrating the minimum standard for the Work.
   C. Locate mock-ups where directed.
   D. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
   E. Do not proceed with remaining work until mock-up is approved by Architect.
   F. Accepted mock-ups may not remain as part of the work; the number of mock-ups shall not be restricted.

1.6 DELIVERY, STORAGE AND HANDLING
   A. Delivery and Acceptance Requirements:
      1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
      2. Do not deliver glazing film materials to the project is fully enclosed, until all concrete, masonry, plaster and other wet work has been completed and dry.
      3. Deliver materials in original unopened packages, containers or bundles bearing brand name, and identification of manufacturer, with labels and package seals intact and legible.
   B. Storage and Handling Requirements:
      1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
      2. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes. Protect glazing films from temperature cycling and temperatures below 40 degrees Fahrenheit.
   C. Damaged material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or show other evidence of damage, unless Architect specifically authorizes correction thereof and usage on project.

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

1.8 WARRANTY
   A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
   B. Manufacturer Warranty: In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTAL GENERAL CONDITIONS, the Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product
data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

PART 2 - PRODUCTS

2.1 GLAZING FILM

A. Basis of Design: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Decorative Films, LLC, Frederick, MD, product: "Solyx - SX-1309".

B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following:
   1. 3M Window Film, St. Paul, MN.
   2. Metropolitan West, Los Angeles, CA
   3. CPFilms, Inc., Martinsville, VA.

C. Glazing film criteria:
   1. Film Type: Vinyl.
   2. Adhesive Type: Pressure-sensitive.
   3. Available Width: 60" (1524mm).
   4. Full Roll Length: 100 linear feet (30.5m).
   5. Thickness: 3-4 mil.
   9. Color/style: As selected by the Architect from manufacturer's full range of available options.

2.2 PERFORMANCE/DESIGN CRITERIA

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

2.3 ACCESSORIES

A. Slip solution: Composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, or as otherwise recommended by glazing film manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   1. Beginning of installation means acceptance of existing substrate and project conditions.

3.2 PREPARATION

A. Surface Preparation: Clean surfaces thoroughly prior to installation.
   1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 APPLICATION

A. Install in accordance with manufacturer's instructions.
B. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.
C. Spray slip solution on window glass and adhesive to facilitate proper positioning of film.
D. Apply film to glass and lightly spray film with slip solution.
E. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
F. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

G. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

3.4 CLEANING

A. Touch-up, repair or replace damaged products before Substantial Completion.

B. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION
SECTION 090506
COMMON WORK RESULTS FOR FLOORING

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes general requirements for flooring preparation, installation and temporary protection.
   1. Provide independent testing laboratory services to perform relative humidity, moisture vapor emission, and pH tests on in situ concrete slabs, which shall be in addition to testing as may be performed by Owner.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Application of protection paper to finished resilient flooring.
C. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
D. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
E. Section 024100 - DEMOLITION: Removal of existing floor finishes
F. Section 096513 - RESILIENT BASE AND ACCESSORIES: Resilient base.
G. Section 096519 - RESILIENT TILE FLOORING: Resilient vinyl tile flooring.
H. Section 096723 - RESINOUS FLOORING: Troweled seamless epoxy flooring system.
I. Section 096813 - TILE CARPETING: Carpet tile and transition strips.

1.3 REFERENCES
A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
   1. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   2. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
   4. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. General: Coordinate flooring work with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

B. Pre-Installation Meetings: At least 30 calendar days prior to commencing any flooring work, conduct a pre-installation conference at the Project site. Comply with requirements of Section 013000 - ADMINISTRATIVE REQUIREMENTS. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
   1. Agenda:
a. Scheduling of preparation and flooring operations.
b. Procedures for testing of relative humidity and moisture content of in situ substrates.
c. Water vapor emission control methods.
d. Application method for primers and adhesives.
e. Review of staging and material storage locations.
f. Coordination of work by other trades.
g. Protection of completed Work.
h. Establishing humidity and temperature limitations for performing the work, to which Architect and Contractor must agree.
i. Discuss process for inspection and acceptance of completed Work of this Section.

C. Sequencing:
1. Sequence flooring installation when base cabinets or other built-in casework is present on the substrate.
2. Field Measurements:
   a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
   b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
3. Ensure that installation of flooring and accessories occurs after other finishing operations, including painting.

1.5 RELATIVE HUMIDITY, MOISTURE VAPOR EMISSION AND ACIDITY/ALKALINITY (PH) TESTING

A. Concrete Slabs and Floors:
1. Contractor shall employ and pay for services of an independent testing laboratory to perform relative humidity, moisture vapor emission, and pH tests on concrete slabs as follows. The test shall be witnessed by the Contractor, flooring subcontractors and Owner’s Project Representative.
   a. Relative Humidity, Moisture Vapor Emission and pH Testing on all concrete slabs over-which a finished floor is to be installed. This includes, but is not limited to:
      1) Resilient sheet flooring, including (but not limited to) linoleum, and vinyl flooring.
      2) Resinous and epoxy resin terrazzo flooring.
      3) Resilient tile and plank flooring, including (but not limited to) linoleum, solid vinyl and composite flooring.
      4) Painted floors and concrete sealers.
      5) Carpet.
   b. Perform moisture and pH tests on all concrete floors over-which stone flooring is to be applied.
2. Requirements: As specified under Part 3 of this Section.
   a. Submit a copy of test data to the installers of all flooring materials or coating materials scheduled to be installed.
   b. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.

PART 2 - PRODUCTS (NOT USED)
PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify that spaces to receive flooring finishes are suitable for installation. Do not proceed with work until unsatisfactory conditions are corrected. Comply with manufacturer’s recommendations including the following:
1. Substrates shall be dry and clean.
2. Substrates shall be free of depressions, raised areas, or other defects which would telegraph through installed flooring.
3. Verify concrete substrates have a flat tolerance of 3/16" in ten linear feet.
4. Temperature of resilient flooring and substrate shall be within specified tolerances.
5. Moisture condition and adhesive bond tests shall be performed as specified herein.

B. For applications on concrete, verify curing, hardening, or breaking compounds have not been used. If there are any, do not proceed until compounds have been removed as specified.
C. For applications on concrete slab on grade or below grade, verify vapor barrier below slab was installed. If no vapor barrier was installed, do not proceed with work unless written acceptance of such conditions is received and submitted.
D. Perform testing of in situ concrete, relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings as specified herein. Do not proceed with work until results of moisture condition tests are acceptable.

3.2 PREPARATION

A. General: Comply with flooring manufacturer's requirements for preparation of substrate to receive resilient flooring.
B. Vacuum clean substrate, and ensure that substrate is dry, clean and smooth prior to application of flooring.
C. Remove, by light sanding and grinding, all protruding edges, high spots.
D. Ensure substrate is flat to a plus or minus 1/8 inch in 10 feet tolerance. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
E. Ensure that substrate is free from paint, varnish, wax, oil, existing adhesive residue, or other foreign matter.
F. Apply primers as recommended by adhesive manufacturer's written instructions.
G. Condition flooring materials, accessories and adhesives to room temperatures for a period of 48 hours minimum.

3.3 TESTING IN SITU CONCRETE SUBSTRATES

A. Scope:
   1. Provide in situ concrete relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings. Includes concrete placed as part of this Work which occurs below grade, above grade (suspended slabs), and slabs on grade.
      a. Existing building suspended slabs may be excluded from this requirement.
B. Scheduling:
   1. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one, nor more than three weeks prior to scheduled flooring installation.
      a. DO NOT conduct testing unless the slab environment is identical to that in which the finished flooring is to be installed.
   2. In the event new flooring is to be installed over existing resilient flooring, remove the portion of the existing flooring and adhesive directly under the area where testing will be conducted. Patch flooring to match existing construction after completion of testing.
C. Test Result Submittals:
   1. Report all test results in chart form listing test dates, time, depth of test well, in situ temperature, relative humidity, moisture vapor and pH levels.
   2. List test locations on chart and show same on marked up Floor Plan Drawings.
   3. Deliver copies of report to Architect, Owner's Project Representative and Contractor.
D. Testing Equipment: Shall be equal to the following
1. For Relative Humidity Testing:
   a. Digital Meter and Calibrated Humidity and Temperature probe kit as manufactured by
      Vaisala Inc. (Boston Office) 10D Gill Street, Woburn, MA, 01801 (telephone
      781-933-4500).
      1) Minimum 2 point probe calibration.

2. For Calcium Chloride Testing:
   a. Anhydrous calcium chloride testing in accordance with Rubber Manufacturer's
      Association (RMA) Test requirements.
   b. Test kits: Vaprecision, inc. 2941 West MacArthur Boulevard, Suite 135. Santa Ana,
      CA 92704 (telephone 800-449-6194).

3. For pH Testing:
   a. pH test paper by Micro Essential Laboratory, Inc., P.O. Box 100824, 4224 Avenue
   b. Distilled or de ionized water.

E. Testing Procedures: General.
1. Initial testing: Provide 3 tests for the first 1,000 square feet.
2. Add one test for each additional 1,000 square feet.
3. Concrete surface area to be tested shall be completely clean. Remove all adhesives,
   residue, debris and sealing compounds. Remove all dust by vacuum or other methods. Do
   not use chemicals of any kind to clean concrete.
4. Perform moisture tests in strict accordance with the kit manufacturer's Instructions.
   Moisture tests shall remain undisturbed for 60 to 72 hours.
5. Immediately after moisture test has been removed from test area, conduct pH test in area
   previously covered by plastic dome of moisture test kit.
6. After completion of tests submit 2 copies of test data to the Architect. Submit a copy of the
   test data to all installers of flooring materials and resinous flooring materials scheduled to
   be installed.
7. Provide additional testing in the event test results indicate higher moisture content than
   recommended by the flooring material and coating material manufacturers for the
   installation of their products. Perform such additional testing, at no additional cost to the
   Owner, after procedures have been performed to reduce moisture content to ratings
   acceptable to the various flooring and coating manufacturers.

F. Testing Procedures: Quantification of Relative Humidity.
1. The test site should be maintained at the same temperature and humidity conditions as
   those anticipated during normal occupancy. These temperature and humidity levels
   should be maintained for 48 hours prior and during test period. If meeting this criteria is
   not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees
   F), and 50 percent (plus or minus 10 percent) relative humidity. When a building is not
   under HVAC control, a recording hygrometer or data logger shall be in place recording
   conditions during the test period. A transcript of this information must be Included with the
   test report.
2. The number of In situ relative humidity test sites is determined by the square footage of
   the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000
   square feet and 1 per each additional 1,000 square feet.
3. Drill test holes utilizing a roto hammer drill. Hole diameter shall not exceed outside
   diameter of the insertable test sleeve by more than 0.04 inch. Drilling operation must be
   dry. Determine the thickness of the concrete slab from Construction Documents. Depths
   of test holes shall be as follows:
   a. For elevated slabs (not poured in pans), drill test holes to a depth equal to 20 percent
      of the concrete thickness.
   b. For slabs on grade and elevated slabs in pans, drill test holes to a depth equal to 40
      percent of the concrete thickness.
4. Vacuum all concrete dust from test hole.
5. Insert a hole liner, or sleeve, to the full depth of test hole, assuring that the liner is capped or plugged at the end protruding from the concrete surface.
6. Permit the test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.
7. Remove the sleeve plug and place a probe into the sleeve assuring that it reaches the bottom of the test hole.
8. Allow the probe to sit in the test sleeve for 30 minutes before taking readings.
9. Read and record temperature and relative humidity at the test site.

G. Testing Procedures: Quantification of Concrete Moisture Vapor Emission through Calcium Chloride Testing.
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F) and 50 percent relative humidity (plus or minus 10 percent). When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 square feet and 1 per each additional 1,000 square feet.
3. Tests sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials 24 hours prior to the placement of test kits.
4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.
5. Expose Calcium Chloride and set dish on concrete surface.
6. Install test containment dome and allow test to proceed for 60 to 72 hours.
8. Weigh test dish on site recording weight and stop time.
9. Calculate and report results as pounds of emission per 1,000 square feet per 24 hours.

H. Testing Procedures: Quantification of Acidity/Alkalinity (pH) Level.
1. At or near the relative humidity test site and each vapor emission (calcium chloride) test site, perform pH test.
   a. At each testing site, lay down a loose 2 foot by 2 foot sheet of non perforated sheet backed by plywood. Leave in place for 48 hours.
   b. Remove sheet and place several drops of distilled or deionized water onto the concrete surface to form a puddle approximately 1 inches in diameter.
   c. Allow the water to set for approximately 60 seconds.
   d. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
2. Record and report results.

3.4 FLOOR PREPARATION - GENERAL REQUIREMENTS
A. General: Comply with ASTM F710 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient flooring adhesive by method acceptable to manufacturer.
1. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.
2. Concrete floors with curing, hardening, and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use blastrac or similar equipment.
B. Fill voids, cracks, and depressions with trowel-applied leveling compounds acceptable to manufacturer. Remove projections and repair other defects to tolerances acceptable to manufacturer.

C. Vacuum subfloors immediately prior to installation to remove loose particles.

3.5 ADHESIVE BOND TESTING

A. Use the specified flooring and recommended adhesive, install approximately 3 by 3 foot sized flooring as specified under individual flooring specification sections. Install test samples approximately 50 feet apart throughout the area. Areas next to walls or other light traffic areas should be selected for the bond test. Tape down the perimeter of the flooring to prevent drying of the adhesive at the edges. After a minimum period of 72 hours the flooring should be pulled from the subfloor. If an unusual amount of force is required, the bond could be considered sufficient. Floors demonstrating unsuitable bond to substrate require modifications to flooring installation and may require application of moisture mitigation products. Review all conditions with Architect/Engineer.

3.6 PROTECTION

A. Provide protection of completed flooring areas from construction traffic until Substantial Completion of the General Contract. Cover all floor surfaces with heavyweight kraft paper and overlay with red-rosin paper, taping the edges to maintain position of the protection paper. Reapply papers as required to maintain floor protection.

END OF SECTION
SECTION 092216
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Non-load-bearing steel framing systems for interior partitions.
B. Suspension systems for interior ceilings and soffits.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 092900 - GYPSUM BOARD: Gypsum board, applied over metal framing.

1.3 REFERENCE STANDARDS
A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
8. ASTM E413 - Classification for Rating Sound Insulation; 2016.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
2. Work of this Section shall be closely coordinated with the work of Section 092900 - GYPSUM BOARD to assure the steady progress of the Contract.

1.5 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
1.6 QUALITY ASSURANCE
   A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
   B. Seismic Compliance: Nonstructural components that are permanently attached to structures and their support attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance to local jurisdiction.
   C. Sole Source: Obtain products required for the Work of this Section from a single manufacturer.
   D. Qualifications:
      1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.

1.7 DELIVERY, STORAGE AND HANDLING
   A. Delivery and Acceptance Requirements:
      1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
   B. Storage and Handling Requirements:
      1. Store and handle materials following manufacturer’s recommended procedures, and in accordance with material safety data sheets.
      2. Protect materials from damage due to moisture, surface contamination, corrosion and damage from construction operations and other causes.

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, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 MANUFACTURERS
   A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      1. Metal components and related items (including non-rated deflection track assemblies):
         a. CEMCO, City of Industry, CA; www.cemcosteel.com.
         f. Telling Industries, LLC, Cleveland, OH; www.buildstrong.com..
      2. Fire rated deflection track assemblies:
         a. CEMCO, City of Industry, CA; www.cemcosteel.com.
   B. The design and details as shown on the drawings and the model numbers specified herein are to establish the standards of design and quality and not to limit competition.

2.3 DESCRIPTION
   A. Regulatory Requirements:
      1. Obtain certificate of compliance from authority having jurisdiction indicating approval of specified products.
2. Fire resistance ratings: Where gypsum board systems with fire-resistance ratings are indicated, provide materials and assemblies of the rating required, tested per ASTM E119, which are identical to those indicated by reference to Gypsum Association file numbers in "Fire Resistance Design Manual" or to design designation in the Underwriters Laboratories "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction and to the Owners’ insurance underwriters.
   a. Fire-Test-Response Characteristics: Provide components that comply with rating requirements specified for fire-rated assemblies under UL 2079 for non-load bearing wall systems.
      1) Deflection Clips and Firestop Track: Connections and/or top runner provided in fire-resistance-rated assemblies shall be certified by UL 2079 for cyclic movement requirements.

2.4 FRAMING MATERIALS
B. Studs: ‘C-shaped’ screw studs, hot-dip galvanized steel, 20 gage-equivalent (nominal 0.02 inches [0.75 mm] of widths indicated on the Drawings.
   2. Acceptable manufacturers:
      a. CEMCO.
      b. ClarkDietrich Building Systems, LLC.
      c. MarinoWARE.
      d. Super Stud Building Products Inc.
      e. Telling Industries, LLC.
C. Runners for Metal Studs: 'U-shaped' hemmed, hot-dip galvanized steel track conforming to ASTM C645, of gage and width to match respective stud sizes, or heavier gage per design requirements, having 1-1/4 inch leg, provided at tops and bottoms of all studs and at heads of all openings in stud partitions.
D. Internal reinforcement for various stud conditions, and bracing as required: 10 gage, minimum, galvanized steel.
E. Furnish cross bracing and knee bracing, as required to assure a completely rigid assembly on metal stud partitions and furred areas.

2.5 DEFLECTION TRACK ASSEMBLIES
A. Non Fire-Rated Assemblies:
   1. Deflection Track: Manufacturer’s standard top runner with extended flanges designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from sheet steel complying with ASTM A653 or ASTM A568. Thickness as indicated for studs, and width to accommodate depth of studs, and the following configuration.
      a. Top runner with extended deep flanges that have one of the following: V-shaped offsets that compress, slots 1 inch on center that allow fasteners for stud attachment; 16 gage sliding clip assemblies attached to top track and clipped to stud, or double track systems as required to meet anticipated vertical movement.
   2. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      a. CEMCO, product; “Slotted Track CST”.
      b. ClarkDietrich Building Systems, LLC, product; "Deep Leg Deflection Track System", “Fast Top Clip”, or “DoubleTrack System”.
      c. MarinoWARE, product: “Slotted Track”.

NON-STRUCTURAL METAL FRAMING
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d. The Steel Network, Inc., product; “VertiTrack VT”, “VertiTrack VTD”, or “VertiClip SLD”.
e. Super Stud Building Products Inc., product: “ITTC 450 Top Track Deflection Clip”.
f. Telling Industries, product; “ViperTrack Deep Leg Deflection Track”.

B. Fire-Rated Assemblies: Head of wall dynamic fire rated joint systems for assemblies in compliance with UL 2079 HW-D. Provide clips or deep leg track system including step bushings complying with ASTM C645 fabricated from steel sheet complying with ASTM A653 or ASTM A568. Thickness as indicated for studs, and width to accommodate depth of studs.

1. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
a. CEMCO, product; “FAS Track UL Assemblies”.
b. ClarkDietrich Building Systems, LLC, product; “SLP-TRK Slotted Deflection Track”.
c. Fire Trak Inc., Watkins, MN, product “Fire Trak”, or “Posi Clips”
d. The Steel Network, Inc., Durham, NC. product; “VertiClip SLD”.

C. Coordination: Verify with partition schedule on the Drawings to ensure proper depth of flange offsets at various partitions types.

2.6 CEILING AND SOFFIT FRAMING MATERIALS

A. Carrying channels, 2 inches deep, 16 gage cold-rolled channels, galvanized.

B. Support channels: 3/4 inches deep, 16 gage cold-rolled channels, galvanized.


D. Metal Studs used in soffit and ceiling framing: ‘C-shaped’ screw studs, hot-dip galvanized steel complying to ASTM C645, 25 gage, of widths indicated on the Drawings, or other gages as required under the specified standards to meet fire resistance ratings.

2.7 ACCESSORIES

A. Metal sheet plate blocking and bracing, where indicated: galvanized sheet 0.0312 inch thickness (20 gage).

B. Fasteners:
   1. Expansion-type fasteners for securing vertical concrete and masonry surfaces.
   2. Concrete stub nails for securing runners to concrete.
   3. Nº.7 by 7/16 inch Pan head self-drilling screw to attach metal framing components.

C. Reinforcing plates for blocking: 20 gage cold rolled sheet steel, provide minimum 6 inch width, or as otherwise indicated on the drawings.

PART 3 - EXECUTION

3.1 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.
3.2 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.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) 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 runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
      b. 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.
   6. Curved Partitions:
      a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
      b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION
SECTION 092900  
GYPSUM BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Interior gypsum board.
B. Cementitious backing board.
   1. Refer to Section 093000 - Tiling.
C. Trim accessories.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 078400 - FIRESTOPPING: Firestopping, firesafing, smoke seals and related accessories.
E. Section 092216 - NON-STRUCTURAL METAL FRAMING: Non-structural steel framing and suspension systems that support gypsum board panels.
F. Section 093000 - TILING: Tile finishes over backer board substrate.
G. Section 099100 - PAINTING: Applied finish coatings.

1.3 REFERENCES
A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
   4. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  11. ASTM E413 - Classification for Rating Sound Insulation.
17. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

B. Sequencing: Do not install gypsum board until all pipes, ducts, conduits, and other such items which are to be enclosed thereby, have been permanently installed, inspected and approved.

1.5 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer's product data, including specifications, performance data, and physical properties for each item furnished hereunder.
   2. Shop Drawings:
      a. Details of any special conditions associated with fireproofing.
      b. Mark-up a set of blackline interior elevations indicate corrections to grid layout and provide dimensioning showing locations of all proposed control joints and expansion joints.
         1) Provide interior elevation drawings for interior elevations which are not included as part of the Contract Drawing set.

1.6 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
B. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five years of experience.

1.7 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.

1.8 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 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.

C. Gypsum Board Assemblies: Provide completed assemblies complying with ASTM C840 and GA-216.
   1. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
      a. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

   2. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.
      a. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
      b. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
      c. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory.

D. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
   1. Gypsum board partitions:

2.2 BOARD MATERIALS
A. Standard Gypsum Board: Conforming to ASTM C1396, 5/8 inch thick, except where other thickness are indicated on Drawings, of lengths to minimize end joints, with tapered edges.
   1. Acceptable products include the following, or approved equal:
      a. USG Sheetrock brand “Gypsum Panels”
      b. National Gypsum Company, Gold Bond brand product “Gypsum Board”.
      c. G-P Gypsum Corporation product, “ToughRock”.

B. Fire Rated Gypsum Board: UL fire resistance rated, ASTM C1396 ‘Type X’ board, 5/8 inch thick, 48 inch width, of lengths to minimize end joints, with tapered edges.
   1. Acceptable products include the following, or approved equal:
      a. USG Sheetrock brand “Firecode Core”
      c. G-P Gypsum Corporation product, “Toughrock Fireguard”.

C. Sag-Resistant Gypsum Board Ceiling Panels: Non-rated 1/2 inch thick, 48 inch width, of lengths to minimize end joints, with tapered edges, conforming to ASTM C1396.
   1. Acceptable products include the following or approved equal:
      a. USG Sheetrock brand product “Interior Ceiling Panel, Sag Resistant”.
      b. National Gypsum Company, Gold Bond brand product “High Strength Ceiling Board”.

   2. At fire-resistant rated ceilings, provide 5/8 inch thick fire-rated gypsum board as specified herein.

2.3 ACCESSORIES
A. Metal Trim Accessories:
   a. Acceptable products include the following or approved equal:
      1) Bailey Metal Products Ltd., model D100.
      2) ClarkDeidrich Metal Framing, model CBS.
      3) Gold Bond product, 1-1/4 inch Wallboard Corner Bead.
      4) USG product “Dur-A-Bead - number 103”.

2. Casing Beads: Edge casing bead with 1/2 inch back leg, for finishing with joint compound fabricated from galvanized steel conforming with ASTM C1047.
   a. Acceptable products include the following or approved equal:
      1) Bailey Metal Products Ltd., model D-200
      2) ClarkDeidrich Metal Framing, model M20B.
      3) Gold Bond product, Wallboard Casing number 100.
      4) USG product “Dur-A-Bead - number 200A”

3. Control Joints and Reveal Trim: “V-shaped control joint, with nominal 3/16 inch reveal

B. Reveal Trim:
   1. Acceptable product or approved equal: Fry Reglet Corporation, model; “DA.1 Reveal” consisting of the following:
      a. Aluminum shall be extruded alloy 6063 T5.
      b. Coating: Clear chemical conversion coating.
      c. Finish: Clar anodized finish.

C. Tapes and Compound:
   2. Joint Tape (at fiberglass faced gypsum): Nominal 2 inch wide, self-adhering (adhesive backed), fiberglass mesh tape.
   3. Joint Compound for setting fiberglass joint tape:
      a. Cetainteed, Valley Forge PA., product “ProRock Moisture and Mold Resistant 90”.
      b. Georgia Pacific Gypsum LCC., Pittsburgh PA, product “Densarmor Cote”
      c. CTS Cement Manufacturing Corporation, Cypress CA., product “Rapid Set OnePass”.
      a. Acceptable products, or approved equal:
         1) USG product “Durabond 20”.
         2) Gold bond product “Stay Smooth 30”.
         3) Georgia Pacific Gypsum LCC, product “ToughRock All-Purpose Dry Mix”
   5. Joint Compound for Finishing: Field mixed joint compound or factory pre-mixed compound.
      a. Field Mixed Compounds: acceptable products, or approved equal:
         1) USG product “Durabond 90”.
         2) Gold bond product “Stay Smooth 90”.
         3) Georgia Pacific Gypsum LCC, product “ToughRock Setting Compound 90”.
      b. Factory Pre-Mixed Compounds: acceptable products, or approved equal:
         1) USG product “Ready-Mixed Joint Compound”.
         2) Gold bond product “All Purpose Compound”.
         3) Georgia Pacific Gypsum LCC, product “ToughRock Ready Mix All-Purpose Compound”

D. Fasteners (interior board systems):
   1. Type S, bugle head screws complying with ASTM C1002, for applying gypsum board to metal framing, ceiling grid system, and furring channels.
      a. Not less than 1 inch long for single layer gypsum board.
      b. Not less than 1-5/8 inch [41mm] long for double-layer gypsum board.
2. Type S-12, fine thread self-drilling screws complying with ASTM C1002, for applying gypsum board to light gage metal framing.
   a. Not less than 1 inch [25 mm] long for 1/2 inch thick single layer gypsum board.
   b. Not less than 1-1/4 inch [31mm] long for 5/8 inch thick single layer gypsum board.
   c. Not less than 1-5/8 inch [41mm] long for double-layer gypsum board.

E. Ceiling Buttons: Perforated type, 1 inch diameter, for use at multiple layered gypsum board ceiling systems.

F. Laminating Adhesive: Ready mix joint compounds as specified herein above.

G. Joint Sealers (interior acoustical sealant type): One component acrylic latex, permanently elastic, non-staining, non-shrinking, non-migrating and paintable. Acceptable products include the following, or approved equal.
   1. Tremco, Beachwood, OH.; product, “Acoustical Sealant”.
   2. United States Gypsum Company, Chicago, IL.; product “USG Acoustical Sealant”.
   3. Pecora Corporation, Harleysville, PA.; product “AC-20 FTR”.

2.4 SOURCE QUALITY CONTROL
   A. Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that all items which are to be enclosed by Work of this Section, have been permanently installed, inspected and approved.
   B. Inspect framing and other substrates; verify that they are in proper condition to receive the work of this Section.
   C. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION
   A. During the operation of gypsum board work, protect all wood, metal, glass, flooring, and other finished materials against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

3.3 INSTALLATION - GENERAL
   A. General: Perform erection procedures for the various gypsum board system conditions, except as otherwise specified, as set forth in GA-216 and GA-220, the written instructions of gypsum board manufacturer, together with the additional requirements specified herein and as indicated on the Drawings.
   B. Where fire-resistive rated assemblies are indicated, erect gypsum board systems in strict accordance with the manufacturers’ UL listed test constructions for the required fire rating on each specific assembly.
   C. Install specified control joints where indicated on Drawings and where run of partitions, or furred surfaces exceeds 30 feet. Show locations of all control joints on shop drawings.
      1. Locate control joints at corners of head frames of doors.
      2. Run vertical control joints continuously to top of partition or furred area, as applicable.

3.4 BOARD INSTALLATION
   A. Screw-fasten only, gypsum board to framing and furring, with ends and edges occurring over firm bearing. At all door jambs screw fasten gypsum panels 8 inches on center to both box studs.
      1. Erect single layer fire-resistance rated gypsum board vertically.
      2. Erect standard gypsum board in most economical direction.
      3. Erect moisture resistant gypsum board in most economical direction.
4. Erect ceiling and soffit gypsum boards to meet UL requirements, where applicable, stagger end joints over supports. Secure gypsum board with fasteners inserted through ceiling buttons; anchor fasteners directly to framing or suspended support system.

B. Wherever items penetrate the gypsum board surfaces, use extra care in cutting the gypsum board to ensure a uniformly-dimensioned joint between the penetrating item and the gypsum board, and fill joints with specified sealant material. Verify the expected deflection factor of the penetrating members, and cut the gypsum accordingly, to prevent damage thereto from the deflecting members.
1. Treat cut edges and holes in moisture resistant gypsum board with approved liquid sealer.
   a. If shellac is used, apply in thin layers to dry quickly.

C. Installing Trim Accessories:
1. General: For trim with back flanges intended for fasteners, attach to framing with same screw fasteners used for gypsum board. Otherwise, attach trim according to manufacturer's written instructions.
   a. Nailing, stapling, or crimping methods to install trim components is prohibited.
2. Install corner beads at all exterior corners of gypsum boards.
3. Install casings (metal trim) wherever gypsum board meets a dissimilar material, and in other locations indicated on the Drawings, except at floors where bottom of the board will be concealed by base, integral with flooring, resilient base, wood base or carpeted base.

3.5 APPLICATION OF ACOUSTICAL SEALANT
A. General: Install sealant and backing in accordance with the recommendations of ASTM C919 and sealant manufacturer's recommendations.
1. Perform preparation in accordance with C1193. Thoroughly clean all joints, removing all loose mortar, oil, grease, dust, frost, and other foreign materials that will prevent proper adhesion of primers and sealant materials.
2. If so recommended and furnished by the specific sealant manufacturer, apply primer to all joint surfaces, taking care not to stain adjacent surfaces.
B. Seal all partition perimeters prior to taping or compounding. Where perimeters are edged with metal trim, apply sealant and backing material between trim and dissimilar material.
C. Seal all penetrations in partition types designated for "acoustical" insulation. Penetrations to receive sealant include electrical boxes, plumbing, heating and air conditioning ducts, telephone, intercom hookups and similar items.
1. Install joint bead back-up in all joints in excess of 5/8-inch depth, and joints that have no back-up therein, placing the joint bead in the joint in a manner that will assure a constant depth 1/8 inch greater than the sealant and caulking material depth tolerances.
   a. Set beads into joints continuously, by slightly stretching during placement, to permit compression against sides of joint, without surface wrinkles or buckles.
   b. Do not stretch back-up material into joints.
   c. Install bond breaker wherever recommended by the sealant manufacturer to prevent bond of the sealant to surfaces where such bond might impair the Work.
2. Apply sealant in continuous beads without open joints, voids or air pockets
   a. The depth of sealant and caulking materials shall be in accordance with manufacturer's recommendations for the specific joint function, but in no case exceed 1/2-inch in depth, nor less than 1/4-inch, regardless of the joint width.
3. Remove the temporary masking tape immediately after tooling, and before the sealant or caulking material has taken initial set.

3.6 APPLICATION OF JOINT TREATMENT
A. Install joint tape at all joints where gypsum boards abut and where boards form internal corners, whether or not such joints will be concealed from view.
B. Apply compound to all joints, edges, corners, fastener head depressions and abrasions in the surfaces, whether or not such conditions will be concealed from view. Sand completely smooth
all compound surfaces, which will be exposed to view, and leave ready to receive applied coatings or finish.

C. Provide the minimum levels of gypsum board finishes as defined by the Gypsum Association recommended specifications GA-214 and GA-216, per the following:
1. At areas hidden from view, except as otherwise specified: Level 1.
2. At areas hidden from view, requiring a fire rating: Level 1.
3. At areas hidden from view, requiring smoke-resistance: Level 1.
4. At areas hidden from view, corridor side of all corridor partitions: Level 1.
5. At concealed plenum spaces above ceilings attic spaces: Level 1.
6. At non-occupied spaces (i.e. attics): Level 1.
7. At surfaces scheduled to receive tile: Level 2.
8. At surfaces scheduled to receive painted finishes: Level 4.
9. At each of the following conditions, provide Level 5 finish:
   a. Boards having glass-fiber facing scheduled to receive a painted finish.
   b. Surfaces subject to long dimensional runs, sun-lit and grazed lighting conditions.
   c. Wall surfaces with a light cove at the ceiling level.
   d. Wall surfaces that are lit with raking light or washed with lights.
   e. Wall surfaces that are perpendicular to an exterior wall that have a window coming right up to the intersection of the interior and exterior walls.
   f. Locations noted on Drawings.

3.7 TOLERANCES
A. Maximum variation for gypsum board partitions and ceilings from true flatness: 1/8 inch per 10 feet, noncumulative.

3.8 CLEANING
A. Daily clean work areas by sweeping and disposing of debris, scraps, and deposits of compound and gypsum fill.
B. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of gypsum fill, and other materials installed under this Section.

END OF SECTION
SECTION 093000
TILING

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Furnish and install the following:
   1. Wall tile.
   2. Floor tile.
   3. Tile base and associated trim.
   4. Cementitious tile backer board.
   5. Installation systems, adhesives, mortars and grouts.
B. Install the following furnished under the designated Sections:
   1. Install access panels into tiled walls as specified under Section 083100 - ACCESS DOORS AND PANELS.
C. Perform drilling and cutting in tile surfaces, as required to accommodate penetrating items of other trades, from templates and instructions furnished by the respective trades.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 061000 - ROUGH CARPENTRY: Wood blocking.
E. Section 079200 - JOINT SEALANTS: Backer rod and sealant at control joints.
F. Section 092216 - NON-STRUCTURAL METAL FRAMING: Metal stud framing to receive cementitious backer board installed under this Section.
G. Division 22 - PLUMBING: Floor drains.
H. Section 224000 - Plumbing Fixtures: Shower receptor.

1.3 REFERENCE STANDARDS
A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   3. ANSI A108.11 - Interior Installation of Cementitious Backer Units.
   5. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
   8. ANSI A118.9 - Cementitious Backer Units.
   9. ANSI A118.10 - Waterproofing.
13. ANSI A10.20 - Safety Requirements for Ceramic Tile, Terrazzo and Marble Work.

B. Inclusionary References: The following reference materials are hereby made a part of this Section by reference thereto:

C. Definitions: For purposes of this specification, the following terms are defined:
1. Wet Areas: Rooms/spaces which has plumbing fixtures, sinks, toilets, or floor drains. Wet areas additionally include rooms/spaces which are exposed to weather.
2. Dry Areas: Rooms/spaces which have no plumbing, sinks, toilets, or floor drains.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

1.5 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 - Administrative Requirements:
1. Product Data: Manufacturer’s product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.
   a. Include maintenance data and recommended cleaning materials, and cleaning and stain removal methods.
2. Shop Drawings: 1/4 inch scale elevations and plans of tile patterns.
3. Selection Samples:
   a. Manufacturer’s sample boards for each type and color group of tile specified, and grout colors, for selections by the Architect.
4. Verification Samples:
   a. Mount tile and apply grout on one 24 by 24 inch cement backer board, for each tile type and selected color, to indicate color and texture variations, tile flatness and joint size variations.
   b. Trim shapes and base, in selected colors in types and shapes indicated for project conditions.
5. Source Quality Control Submittals:
   a. Grade Certificates: Manufacturer’s Master Grade Certificates submitted prior to shipment of tile to project.

B. Maintenance Material Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.
1. Extra Stock Materials: Upon completion of the Work of this Section, deliver to the Owner extra materials in, an amount equal to 3 percent of tile and trim of each color, finish and type installed.

1.6 QUALITY ASSURANCE
A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
B. Qualifications:
   1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.

1.7 MOCK-UPS
   A. Provide mock-up under provisions of Section 014000 - QUALITY REQUIREMENTS.
      B. Provide waterproofing mock-up, minimum 12 square feet, illustrating a lap joint, planar transition, and piping penetration, demonstrating the minimum standard for the Work.
         1. Mock-up will demonstrate quality of work, construction methods, color and texture of tile, flatness of installation, joint spacing and color of grout. Include typical tile accessories and a control joint.
         2. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
         3. Accepted mock-ups may remain as part of the work; the number of mock-ups shall not be restricted.
   C. Provide full system mock-up panels, minimum 12 square feet, illustrating color, texture and finish, and demonstrating the minimum standard for the Work.
         1. Mock-up will demonstrate quality of work, construction methods, color and texture of tile, flatness of installation, joint spacing and color of grout. Include typical tile accessories and a control joint.
         2. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
         3. Accepted mock-ups may remain as part of the work; the number of mock-ups shall not be restricted.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Delivery and Acceptance Requirements:
      1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
      2. Deliver tile in manufacturer’s sealed cartons, grade-sealed by the manufacturer in accordance with ANSI A 137.1, with grade-sealed unbroken, and clearly marked as to contents, color, and quantity.
      3. Deliver and store tile setting materials in original, sealed, containers showing manufacturer’s identification, year of production, new weight, date of packaging, and location of packaging.
   B. Storage and Handling Requirements:
      1. Store and handle materials following manufacturer’s recommended procedures, and in accordance with material safety data sheets.
      2. Store and protect containers above floor level, keep dry until ready for use.
      3. Protect adhesives from freezing or overheating in accordance with manufacturer’s instructions. Store mortar and grouts at 70 degrees Fahrenheit (21º C) temperature for 24 hours prior to use.

1.9 SITE CONDITIONS
   A. Environmental conditions:
      1. General: Maintain ambient temperatures between 50 (10º C) and 80 (26º C) degrees Fahrenheit in tiled areas, for 24 hours prior to installation, during installation and for 7 days after completion.
      2. Special environmental conditions for setting materials: Maintain ambient temperatures between 65 degrees Fahrenheit (18º C) and 80 degrees Fahrenheit (27º C) in tiled areas, for 24 hours prior to installation, during installation and for 7 days after completion.
      3. When temperature of substrate exceeds 90 (32º C) degrees Fahrenheit, contact manufacturer for instructions.
B. Do not install setting or grouting materials in a closed, unventilated environment. Ventilate propane or fossil fuel heaters to prevent damage to tile work from carbon-dioxide build up.

1.10 WARRANTY

A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

B. Manufacturer Warranty: The manufacturer of installation systems, adhesives, grouts and mortars shall provide a comprehensive non pro-rated written five (5) year warrantee against defective products which covers replacement materials and labor costs for demolition, tile accessories, and installation systems.
   1. Warranty to provide for tile lifting or separation from substrate, and setting bed/grout deterioration, when products have been installed with referenced TCNA setting systems using specified setting and grout materials.
   2. Warranty excludes structural failure, movement or cracking of substrate materials, and workmanship performed not in accordance with manufacturer's instructions and industry standard guidelines.

C. Special Warranty: Provide 2 year, non pro-rated warranty which shall include provisions for cracking, breakage or failure of tile due to defective workmanship
   1. Materials must be compatible and from one source, single source responsibility for waterproofing, installation, mortars and grouts. Job-site mixtures of sand portland cement and site dilution of additives shall not be permitted.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products are limited to the following:
   1. Basis of Design: Floor tile, wall tile, and base tile: Dal-Tile Corporation, Dallas, TX.
   3. Mortars, adhesives & Grouts:
      a. Custom Building Products, Inc., Seal Beach, CA.
      b. Laticrete International, Inc., Bethany, CT
      c. Mapei Corporation, Elk Grove, IL.
   4. Cementitious tile backer board ("Cement board"):
      a. Custom Building Products, Inc., Seal Beach, CA.
      b. Fin Pan, Inc., Hamilton, OH.
      c. Unifix, Inc., division of National Gypsum Company, Charlotte, NC.
      d. United States Gypsum Company, Chicago, IL.

2.2 TILE

A. Tile for walls and floors installed as indicated on the Drawings.
   1. Basis of Design (TL-1, TL-1A): Dal-tile, product "Industrial Park" series, ceramic tile with procelain finish consisting of the following characteristics:
      a. Color: As selected by Architect unless otherwise indicated on the Drawings.
      b. Finish: As selected by Architect unless otherwise indicated on the Drawings.
      c. Size:
          1) Wall/Floor Tile: 12 inches by 24 inches (30.00 cm by 60.48 cm).
          2) Base Tile (WB-2A): 6 inch cut with Schluter cap.
      d. Thickness: 3/8 inches.
      e. Square Feet/Carton: 15.60,
      g. Water Absorption C373 < 0.5%.
      h. Breaking Strength C648 > 275 lbs.
      i. Scratch Hardness MOHS 8.0.
j. Chemical Resistance C650 Resistant.

2. Basis of Design (TL-2A): Mosa, product "Colors" series consisting of the following characteristics:
   a. Color: As selected by Architect unless otherwise indicated on the Drawings.
   b. Size: 4 inches by 8 inches.

2.3 SETTING MATERIALS

A. Epoxy mortar: complying the requirements of ANSI A118.3. Acceptable products include the following or approved equal:
   1. Basis of Design: Laticrete product “Latapoxy 300”.
   2. Mapei product: “Kerapoxy”.
   3. Custom Building Products “EBM-Lite”.

2.4 GROUTING MATERIALS

A. Epoxy grout: Multi-component epoxy grout, stain resistant, conforming to ANSI 118.3.
   1. Epoxy Grout shall be non-toxic, non-flammable, non-hazardous during storage, mixing, application and when cured and shall meet the following minimum physical requirements in compliance with ANSI A118.3 test methods:
      a. Compressive Strength: 6600 psi (464 kg/cm²) min.
      b. Shear Bond Strength: 100 psi (70 kg/cm²) min.
      c. Water Absorption: 1/2% max.
      d. Service Temperature: up to 230°F (110°C)
   2. The finished Epoxy grout shall be chemically and stain resistant to catsup, mustard, tea, coffee, milk, soda, beer, wine, bleach (5% solution), ammonia, juices, vegetable oil, brine, sugar, cosmetics, and blood. It shall also be chemically resistant to dilute acids and alkalis, gasoline, turpentine, and mineral spirits.
   3. Acceptable products are limited to:
      c. Custom Building Products, product “100% Solids Epoxy”.
   4. Submit color selector to Architect for approval.

2.5 ACCESSORIES

A. Edge protection at tile terminations shall be Schluter, product: “Jolly - #A100ATGB”.

B. Edge protection at outside corners shall be Schluter, product "Quadec".
   1. Size: As selected by Architect unless otherwise indicated on the Drawings.
   2. Finish: Stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   1. Verify that all concrete substrates are at least 28 calendar days old, completely cured and free of negative hydrostatic conditions or moisture problems.

B. Beginning of installation means acceptance of substrate and site conditions.

3.2 PREPARATION

A. During the operation of work of this Section, protect surrounding in situ materials and finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all surfaces which are soiled or otherwise damaged by Work of this Section, to match indicated profiles and specified finishes. Materials and finishes which cannot be cleaned, or
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repaired shall be removed and replaced with new work in conformance with the Contract Documents.

B. Ensure that all anchors, plugs, electrical and mechanical work to be in or underneath tile have been installed.

C. Vacuum clean substrate surfaces.

D. Seal concrete substrate cracks with filler; level concrete substrate to acceptable flatness tolerances.
   1. The use of PVA bonding agents or gypsum based leveling materials is prohibited.

E. Apply conditioner or primer to surfaces as recommended by adhesive manufacturer.

3.3 INSTALLATION - GENERAL

A. Installation Standards: The American National Standard Specifications for the Installation of Ceramic Tile, 1992 edition (ANSI A108), is hereby made a part of this specification. All work of this Section shall be installed in accordance with the requirements contained in referenced ANSI A108 standards, and as additionally specified below, and in accordance with the manufacturer’s specifications of those products used.

B. Installation Methods: Schedule of substrate conditions, generic type of tile used, with appropriate setting and grouting methods are listed at end of this Section.
   1. Use trowel shapes and sizes as recommended by setting materials manufacturer.
   2. Back-butter tiles as required to provide coverage indicated, except for tiles exceeding 144 square inches which require a complete back application of mortar (100% coverage).

C. Tile Patterns and types: Tile patterns are shown on the Drawings, if more information is required, obtain the necessary information from the Architect. Do not interrupt tile pattern around openings.

D. Tile Layout and installation
   1. Layout tile on room axis, leaving equal sized border units of not less than one-half tile width.
   2. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align base and wall joints.
   3. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, full without voids, cracks, excess mortar, or excess grout.
   4. Do not align joints of base units and lowest course of tile, offset joints by one-half of unit width.

3.4 INSTALLATION OF CEMENT BOARD

A. Wall framing substrate: Do not install cement board directly over protrusions from stud plane such as heavy brackets or fastener heads.

B. Make necessary cut-outs. Install cement board horizontally leaving 1/8 to 3/16 space at all joints, including joints with dissimilar materials. Stagger board joints with those of adjacent rows.

C. Fasten cement board with 1-1/4 inch length type S bugle head screw. Fasten boards every 8 inches on center in field and along edges. At edge conditions, locate fasteners between 1/2 inch to 2 inches from board edge.

D. At all joints and corners, fill gap solidly with dry-set or latex-modified, portland cement mortar and imbed 2 inch mesh fiberglass table and smooth material over joint and corner.

3.5 INSTALLATION - CUTTING

A. Glass and Porcelain Stone Tile: For small tile, glass cutters (score and snap) shall be used in conjunction with a new scoring wheel. For larger tile, continuous rim diamond tip blades which are designed to cut porcelain tile and glass shall be used in conjunction with wet saws. Blades which are designed for cutting ceramic tile will create chips and irregularities along the cutting line and shall not be used.
1. To avoid course cuts, scoring wheels shall be replaced as needed and diamond blades shall be re-dressed with an abrasive dressing stone, or replaced.

B. Sharp edges and corners shall be smoothed and dulled with a diamond hand pad (white stone) or carbide paper as recommended by the manufacturer.

C. In the event that the above instructions are not followed resulting in dissatisfactory appearance, the Owner and Architect reserve the right to require the tiling work to be replaced.

3.6 INSTALLATION - METAL EDGE TRIM AND TRANSITION STRIPS

A. General: Install in accordance with ANSI A108.5, TCNA installation method number F113, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.

1. Ensure that top surface of metal edge and transition strips align with surface plane of tile.

B. Press perforated anchoring leg of trim into troweled dry set mortar bedding. Trowel additional mortar over perforated anchoring leg of trim to ensure full coverage and support of tile edges.

C. Solidly embed tiles in manner that tiled surface is flush with top of trim profile. Tile may exceed trim height by 1/32 inch [1 mm] to 1/16 inch [1.5 mm], but tile may not be installed lower than height of trim. Maintain a 1/8 inch [3 mm] minimum uniform joint width between edge of tile and metal trim to be filled by grout. Schluter/stainless jolly trim at top, bottom and outside corners of tile.

D. Grouting: Install in accordance with installation requirements of abutting tile.

3.7 INSTALLATION OF CONTROL JOINTS

A. General: Provide control joints where indicated on the Drawings, and as directed by the Architect. Where not indicated, provide joints per the following requirements in specific locations approved by Architect:

1. Interior tilework: 24 to 36 feet in each direction, except where exposed to direct sunlight or moisture.

2. Interior tilework exposed to direct sunlight or moisture: 12 to 16 feet in each direction.

3. Where tile abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, and where changes occur in substrate materials.

4. At perimeter walls in rooms and spaces larger than 12 feet on one side.

5. As continuation of expansion joints, control joints, and seismic joints in the building structure which occur in tile areas.

B. Locations: Verify exact locations of joints with Architect prior to commencing tile installation.

C. Control joints:

1. Form control joints neat, straight, and uniformly wide equal to width of normal tile joint. Cut tile neatly and to accurate radius at exposed junction with pipes.

2. Extend control joints full thickness of tile, setting bed and reinforcing.

D. Keep open joints free of grout and debris until filled with sealant. Install non-contaminating temporary joint filler to maintain joints in clean condition until installation of joint backing and sealant under Section 079200 - Joint Sealants.

3.8 FLOORING INSTALLATION - TCNA NUMBER F131

A. Description: Thin-set epoxy tile installation.

B. General: Install in accordance with ANSI A108.6, TCNA installation method number F131, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.

1. Setting materials: epoxy mortar (ANSI A118.3).

2. Grout materials: epoxy grout (ANSI A118.3).

C. Install a 1/16 inch thick skim coat of epoxy mortar with flat side of trowel, apply additional adhesive to 3/32 inch depth, or as otherwise recommended by setting material manufacturer.
D. Install tile fully bedded.
E. Grouting:
   1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.
   2. Grout tile joints in accordance with ANSI A108.6, TCNA installation method number F131, and as additionally specified.

3.9 FLOORING INSTALLATION - TCNA NUMBER F122 MODIFIED WITH EPOXY GROUT
A. Description: Thin-set tile installation with reinforced waterproofing membrane.
B. General: Install in accordance with ANSI A108.5, and TCNA installation method number F122, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
   1. Setting materials:
      b. Bonding coat: Latex modified portland cement (ANSI A118.4).
   2. Grout materials: epoxy grout (ANSI A118.3).
C. Install liquid applied waterproofing membrane with reinforcing over entire tile substrate area in strict compliance with manufacturer's written instructions.
D. Install latex/portland cement mortar bed over cured anti-fracture membrane to a nominal thickness of 3/32 inch.
E. Grouting:
   1. Allow tile to fully set prior to grouting; do not grout in less than 48 hours after installation of tile.
   2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

3.10 FLOORING INSTALLATION - TCNA NUMBER F125A
A. Description: Thin-set tile installation with anti-fracture membrane.
B. General: Install in accordance with ANSI A108.5, and similar to TCNA installation method number F125A as modified by requirements herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
   1. Setting materials:
      b. Bonding coat: Latex modified portland cement (ANSI A118.4).
   2. Grout materials: epoxy grout (ANSI A118.3).
   3. Traffic bearing sealant at movement joints over cracks isolation in lieu of grout.
C. Install anti-fracture membrane over entire tile substrate area in strict compliance with manufacturer's written instructions.
D. Install latex/portland cement mortar bed over cured anti-fracture membrane to a nominal thickness of 3/32 inch.
E. Grouting:
   1. Allow tile to fully set prior to grouting; do not grout in less than 48 hours after installation of tile.
   2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

3.11 WALL TILE INSTALLATION - TCNA NUMBER W244C
A. General: Install in accordance with ANSI A108.5, TCNA installation method number W244C, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
   2. Grout materials: Grout per ANSI A118.3.
B. Install latex/portland cement mortar bed to a nominal thickness of 3/32 inch.
C. Grouting:
   1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.
   2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

3.12 INSTALLATION - GROUT
A. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
B. Force the maximum amount of the approved grout into joints in accordance with pertinent recommendations contained in ANSI A108.10.
C. Fill in joints of cushion-edge tile to depth of the cushion; fill joints of square-edge tile flush with the surface.
D. Fill all gaps and skips. Do not permit mortar or mounting mesh to show through grouted joints.
E. Provide hard finished grout which is uniform in color, smooth and without voids, pin holes, or low spots.
F. Remove all excess grout immediately after installation thereof, wash and rinse tile free from grout film, and tool grout to a uniform density throughout.

3.13 REPAIR
A. Replace cracked chipped, broken, and otherwise defective tiles.
B. Remove work not complying with requirements of the Contract Documents or the referenced standards, and promptly replace with work which does comply.

3.14 CLEANING
A. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of mortar, grout, and other materials installed under this Section, and wash completed tilework.
   1. Do not use acid or acid cleaners to clean tile.
   2. When tile is thoroughly clean and dry, polish glazed tile with clean dry cloths.

3.15 CURING
A. Cover with clean non-staining 40 pound kraft paper. Do not use polyethylene sheets directly over tile on horizontal surfaces.

3.16 PROTECTION
A. Do not permit traffic over finished floor surface until grout and tile materials are fully set, and not less than 72 hours. Protect floor surfaces with heavy red-rosin paper or kraft paper.

END OF SECTION
SECTION 095100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish and install the following:
   1. Suspended acoustical tile ceiling including suspension system and associated edge moldings.

B. Patching acoustical tile ceilings to match existing ceilings where disturbed by demolition and Work of this Contract. This Section includes both concealed and exposed spline ceilings, suspension systems and associated edge moldings.
   1. In rooms where existing partitions have been removed, instead of patching, the Contractor shall replace the entire ceiling and suspension system in the room with new.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 024100 - DEMOLITION: Demolition of work abutting existing ceilings and demolition of existing ceilings for new construction.

E. Section 083100 - ACCESS DOORS AND PANELS, and by trades requiring the same: Shop primed access panels, occurring in partitions and walls.

F. Section 092216 - NON-STRUCTURAL METAL FRAMING: Metal ceiling and soffit framing for gypsum board, including hanger attachments, wire hangers, and screwable metal tee grid system.

G. Section 092900 - GYPSUM BOARD: Suspended drywall construction ceilings and soffits.

H. Section 079200 - JOINT SEALANTS: Sealant at gaps between new acoustical ceiling edge angles and all irregular walls.

I. Division 21 - FIRE PROTECTION: Sprinkler heads in ceiling system.

J. Division 23 - MECHANICAL: Air diffusion devices in ceiling.

K. Division 26 - ELECTRICAL:
   1. Fire alarm and smoke detection equipment mounted in ceiling system.
   2. Light fixtures and independent hangers for suspended fixtures.

1.3 REFERENCE STANDARDS

A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
   1. ASTM A641 - Zinc- Coated (Galvanized) Carbon Steel Wire
   2. ASTM C523 - Light reflectance of Acoustical Material by the Integrating Sphere Reflectometer.
   3. ASTM E84 - Surface Burning Characteristics of Building Material "UL Classified"
   4. ASTM E119 - Fire Tests of Building Construction and Materials "UL Classified".
   5. ASTM E413 - Classification for Rating Sound Insulation.
   6. ASTM E1264 - Classification of Acoustical Ceiling Products.
7. ASTM E1414 - Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum. "UL Classified".
8. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

B. General References The following reference materials are hereby made a part of this Section by reference thereto:
   1. CISCA (Ceilings and Interior Systems Contractors Association) - Acoustical Ceilings: Use and Practice.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

B. Sequencing:
   1. Field Measurements:
      a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
      b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
   2. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, to allow work which will be concealed by the ceilings to be completed prior to commencing installing the ceilings in such locations.

C. Scheduling:
   1. Install acoustical units after interior wet work is dry.
   2. Schedule work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead work is completed, tested and approved.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
   2. Shop Drawings:
      a. 1/4 inch scale plans of each room or space; indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to the system.
      b. All drawings bearing dimensions of actual measurements taken at the project.
      c. Large scale installation details of special conditions.
   3. Verification Samples:
      a. 12 by 12 inch samples of acoustical units, illustrating material and finish.
      b. 12 by 12 inch samples of existing acoustical units for comparison with supplied materials.
c. 12 inch long samples of suspension system components including main runners, cross runner and edge trim.
d. 12 inch long samples of existing exposed spline suspension system components including runners and edge trim for comparison with supplied materials.

B. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
1. Bonds and Warranty Documentation:
   a. Manufacturer's Warranties and guarantees as specified elsewhere herein this Section.

C. Maintenance Material Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.
1. Provide to the Owner, extra ceiling panels: 5 percent of each type installed.
2. Provide to the Owner, extra suspension components: 5 percent of each type installed.
3. Provide to the Owner, all extra salvaged ceiling panel and suspension components which have not been utilized in the Work.

1.6 QUALITY ASSURANCE
A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of acoustical ceiling panels.

1.7 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
   1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
   2. Do not deliver acoustical ceiling panels to the project until all concrete, masonry, plaster and other wet work has been completed and dry.
   3. Deliver acoustical ceiling panels in original, unopened packages and store protected in a fully enclosed space.
B. Storage and Handling Requirements:
   1. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
C. Damaged material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or show other evidence of damage, unless Architect specifically authorizes correction thereof and usage on project.

1.8 SITE CONDITIONS
A. Maintain uniform temperature of minimum of 60 degrees Fahrenheit and humidity of 20 to 40 percent prior to, during, and after installation.

1.9 WARRANTY
A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
B. Manufacturer Warranty:
   1. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTAL GENERAL CONDITIONS, the Contractor shall obtain in the Owner’s name the standard written manufacturer’s guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer’s published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.
PART 2 - PRODUCTS

2.1 DESCRIPTION

A. General Description: Manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance as indicated.

2.2 ACOUSTICAL UNITS

A. Acoustical Units (ACT-1) - General: ASTM E1264, Class A, ceiling tile consisting of the following:
   1. Basis of Design: USG "Mars Healthcare" consisting of the following;
      a. Size: 24 inches by 24 by 7/8 inches.
      b. Fire rating: Class A.
      c. Item No. 86257.
      d. NRC: 0.85.
      e. CAC: 35.
      f. LR: 0.90.
      g. Grid: USG DX/DXL.
      h. Color: White.

2.3 SUSPENSION SYSTEM(S)

A. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

B. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c.
   1. Hangers: ASTM A641 Soft temper, pre-stretched galvanized carbon steel wire, with a yield stress of at least 3 times design load, but not less than 12 gage.

C. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c.

D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

E. Suspension systems shall conform to ASTM C 635, intermediate duty.

F. Provide manufacturer's standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.4 ACCESSORIES

A. Drywall Grid: As recommended by the manufacturer, or as shown on the Drawings.

B. Edge moldings: Standard edge trim: Grid system manufacturer's standard L-shape edge trim compatible with exposed grid system and color matched.

C. Retention clips:
   1. USG Donn Brand Panel Retention Clip - 20428.

D. Sealant as specified in Section 079200 - JOINT SEALANTS:
   2. Joint Sealer Type SP, (Silicone, Paintable all purpose).

2.5 CEILING GRID PERIMETER EDGE TRIM SYSTEM

A. Perimeter edge trim system at "Floating" suspended ceiling areas. Edge trim shall have a height(s) as indicated on the reflected ceiling plans and detail sheets, and shall be designed to accommodate straight edges as well as converse curved and convex curved edges as may be
indicated on Drawings. Attachment to grid system is provided by a specially designed attachment clip, which snaps into the locks against hems of trim and is screw-attached to the bulb of the intersection suspension system member. Independent sections of trim are joined together using the splice plate. Field paint perimeter trim where used with wood plank ceiling system. Acceptable products are:

   a. Axiom trim Type-1: Equal to Armstrong Model No. AX10CUR, 10 inch curved, (120 by ¼ by 10 inches).
   b. Axiom trim Type-2: Equal to Armstrong Model No. AX4CUR, 4 inch curved, (120 by ¾ by 4 inches).
   c. Axiom trim Type-3: Equal to Armstrong Model No. AX4CUR AX1PC6CUR.
2. Chicago Metallic: Infinity suspension trim.
3. USG: Compasso series.
   a. Color: As selected by the Architect from manufacturer’s full range of available options.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   1. Beginning of installation means acceptance of existing substrate and project conditions.

3.2 PREPARATION
A. Protection of In-situ Conditions: During the operation of work of this Section, protect existing finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing materials which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Existing materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work to match existing.

B. Surface Preparation:
   1. Carefully examine all receiving surfaces, to which attachments will be made hereunder, and determine the most practical way of making such attachments. Request Architect's approval of any attachment method which differs from that indicated on the approved shop drawings before proceeding with installation.
   2. Permit acoustical ceiling tile to reach room temperature and a stabilized moisture content prior to installation.

C. Existing Acoustical Ceilings to be Salvaged or Patched:
   1. Where existing ceilings are disturbed by the work of this Contract and are not scheduled to be replaced with new ceilings; remove ceilings including suspension system, as required. Remove only that portion of the acoustical materials and suspension system as is necessary for the required work. Coordinate with all trades to determine the extent of area to be removed.
   2. Store materials in a neat manner and protect from damage and after all related work has been completed, reinstall the existing ceiling materials.
   3. Where acoustical panels, acoustical tiles and suspension system have been removed because of new construction and cannot be reinstalled, install new material to match existing. All materials to be used for patching and matching shall be approved by the Architect in advance of work.

3.3 INSTALLATION
A. Locate system on room axis, leaving equal sized border units of not less than one-half tile width.
B. Install all components of the suspended grid systems in accordance with the manufacturer's instructions, the approved shop drawings, conforming to ASTM C-636 requirements. Ensure a deflection not to exceed 1/360 span of 48-inch simple span.

C. Install specified edge moldings wherever ceilings intersect a wall or partition surface, and around all items having any dimension of 4 inches or more which penetrate the ceilings, including circular penetrations. Set moldings absolutely level, using as long lengths as practicable, and secure with fasteners recommended by manufacturer for the type of substrate.
   1. Sealant Bed: Apply continuous ribbon of acoustical sealant (type AA specified under Section 079200 - JOINT SEALANTS), concealed on back of vertical leg before installing moldings.
   2. Screw-attach moldings to substrate at intervals not over 16 inches on center, and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

D. Install hanger attachments to overhead construction in accordance with the approved shop drawings, spacing the attachments not more than 48 inches on centers over location of each main tee member.
   1. Aluminum Suspension Systems: Provide hangers spaced not more than 30 inches on center in each direction and not more than 8 inches from ends
   2. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers to span the extra distance.
   3. Install hanger wire to attachments with triple twists.

E. Install main tees parallel to the long dimension of each area, spacing the tees 48 inches on centers. Secure the bottom of hanger wires through slots in the main tee members and tie with triple twists. Level the main tees as the work progresses.

F. Uniformly space the cross tees at 24 inches on centers, and secure the cross tees into the main tees as recommended by the system manufacturer.

G. Fit acoustical ceiling tile units in place, free from damaged edges or other defects detrimental to appearance and function. Install acoustical ceiling tile level, in uniform plane, and free from twist, warp or dents.
   1. Field cut tegular type tile with a tegular reveal at all edge conditions.
   2. Where required by governmental agencies having jurisdiction, install retention clips, provide two clips per ceiling panel installed on opposite sides of panel.

3.4 TOLERANCES
   A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
   B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 CLEANING
   A. Properly clean surfaces of panels and open grids free from dirt and handling marks. Wherever surfaces cannot be cleaned by normal methods or have defects, remove and replace with new components.

3.6 PROTECTION
   A. Protect finished work under provisions of Section 015000 - TEMPORARY FACILITIES AND CONTROLS.

END OF SECTION
SECTION 096513
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Prepare substrate to receive resilient base.
B. Furnish and install the following:
   1. Coved resilient base as indicated.
   2. Straight resilient base as indicated.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply
to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives,
cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and
   administrative requirements for construction and demolition recycling.
D. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Application of protection paper
to finished resilient flooring.
E. Section 024100 - DEMOLITION: Removal of existing finishes.
F. Section 090506 - COMMON WORK RESULTS FOR FLOORING: General requirements for
   flooring preparation, installation and temporary protection.
G. Section 093000 - TILING: Tile flooring and marble thresholds.
H. Section 096519 - RESILIENT TILE FLOORING: Tile vinyl flooring.
I. Section 096813 - TILE CARPETING: Carpet tile and transition strips.

1.3 REFERENCES
A. Comply with applicable requirements of the following standards and those others referenced in
   this Section, under the provisions of Section 014200 - REFERENCES. Where these standards
   conflict with other specified requirements, the most restrictive requirements shall govern.
   1. ASTM E 84 - Surface Burning Characteristics of Building Materials.
   2. ASTM F 1861 - Standard Specification for Resilient Wall Base
   3. All applicable federal, state and municipal codes, laws and regulations regarding
      flammability and smoke generation of interior finishes.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. General: Coordinate the work of this Section with the respective trades responsible for
      installing interfacing and adjoining work for proper sequence of installation, and ensure
      that the work performed hereunder is acceptable to such trades for the installation of their
      work.
B. Sequencing:
   1. Sequence work to ensure resilient flooring is not installed until building is enclosed,
      sufficient heat is provided, dust generating activities have terminated, wet work is dry and
      cured, and work overhead is completed.
   2. Ensure that installation of flooring and accessories occurs after other finishing operations,
      including painting.

1.5 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 -
   ADMINISTRATIVE REQUIREMENTS:
1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions.
   a. Include certification of data indicating Volatile Organic Compound (VOC) content of all adhesives. Submit MSDS highlighting VOC limits.

2. Selection Samples: Manufacturers' sample chain of colors available for selection by the Owner's Project Manager and the Architect.

3. Verification Samples: Each type resilient base and color selected, 24 inches long.

B. Maintenance Material Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.

1. Extra Stock Materials: Upon completion of the Work of this Section, deliver to the Owner extra materials for future repairs and maintenance, an amount equal 24 linear feet for each color and type of resilient base installed.

1.6 QUALITY ASSURANCE
A. General: Avoid color and pattern differential; provide base from one production run in any single room or contiguous areas.

1.7 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
   1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Owner's Project Manager and the Architect.
   2. Deliver resilient base materials in original, unopened packages and store protected for three days prior to installation in area of installation to achieve temperature stability.

B. Storage and Handling Requirements:
   1. Store materials in a clean dry, enclosed space off the ground and protected from the weather. Protect adhesives from freezing.

1.8 SITE CONDITIONS
A. Maintain uniform temperature of minimum of 65 degrees Fahrenheit and humidity of 20 to 40 percent 48 hours prior to, during, and 48 hours after installation. Store resilient flooring materials and accessories in the spaces where they will be installed for at least 48 hours before beginning installation. Thereafter, maintain a minimum temperature of 55 degrees Fahrenheit in the areas where the work is completed.

1.9 WARRANTY
A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

B. Manufacturer Warranty:
   1. Resilient Base: Provide manufacturer's standard one year limited product warranty for resilient base materials.
   2. Adhesives: Provide manufacturer's one year limited product warranty for adhesion reliability.

PART 2 - PRODUCTS
2.1 DESCRIPTION
A. Regulatory Requirements:
   1. Provide materials and assemblies conforming to applicable building codes and regulatory agencies for flame/fuel/smoke rating requirements of base trim in accordance with ASTM E 84.

2.2 RESILIENT BASE
A. Basis of Design (WB-1A, WB-1B): Johnsonite Traditional Wall Base, ribbed back, rounded top complying with ASTM F-1861, Type TP, Thermoplastic Rubber (TBR). Rubber base shall be furnished in continuous lengths, approximately 120 feet long.
RESILIENT BASE AND ACCESSORIES

1. Color: As selected by Architect unless otherwise indicated on the Drawings.
2. Size: 4 inches.
3. Thickness: As selected by Architect.
4. Coved base shall be used at all resilient flooring.
5. Straight base shall be used at all carpeted areas.

B. Base accessories: Pre-molded end stops of same material, size and color as base. Job-form all external and internal corners from base material, pre-molded corner pieces will not be acceptable.
1. All wall base shall be coil product. Products that come in straight lengths are not acceptable.

2.3 ACCESSORIES

A. Adhesives:
1. General: Water resistant, low VOC, acceptable to the resilient flooring manufacturer, for substrate conditions.
   a. Base Adhesives: Maximum VOC 50 [g/L less water]
2. Acceptable manufacturers:
   b. DAP Incorporated, Dayton, OH, product: "Cove Base Construction Adhesive”.

B. Joint Sealer for between the top of wall base and irregular wall surfaces: Plastic filler as recommended by manufacturer.

C. Cleaning material: Domestic neutral floor detergent having a pH 7 or pH 8, as recommended by the flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
C. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 INSTALLATION

A. Install all products in strict accordance with each manufacturer's written installation procedures and other provisions specified herein.
B. Spread only enough adhesive to permit installation of materials before initial set.
C. Install Resilient base: Install base on solid backing, bond to vertical substrate with continuous contact at horizontal and vertical surfaces. Apply wall base to walls, columns, casework and other permanent fixtures in areas where base is required.
1. Install in lengths as long as practical.
2. Scribe to fit to door frames and other interruptions.
3. Form all external and internal corners in accordance with manufacturer's written instructions. Cope inside corners and fit neatly.
4. Fill voids with plastic filler along the top edge of the resilient wall base on masonry surfaces or other similar irregular substrates.

3.3 CLEANING

A. Daily clean work areas by sweeping and disposing of debris, and scraps.
B. Post-installation Cleaning: As installation progresses, continually remove excess adhesive from floor, base and wall surfaces without damage.

END OF SECTION
SECTION 096519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. The work of this Section consists of resilient tile flooring where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.

B. Furnish and install the following:
   1. Vinyl composition tile flooring.
   2. Vinyl transition strips wherever edges of resilient tile flooring materials abut dissimilar flooring, where no thresholds occur.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Application of protection paper to finished resilient flooring.

E. Section 024100 - DEMOLITION: Removal of existing finishes.

F. Section 090506 - COMMON WORK RESULTS FOR FLOORING: General requirements for flooring preparation, installation and temporary protection

G. Section 093000 - TILING: Tile flooring and marble thresholds.

H. Section 096513 - RESILIENT BASE AND ACCESSORIES: Resilient base.

I. Section 096813 - TILE CARPETING: Carpet tile and transition strips.

1.3 REFERENCES

A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

   2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
   4. ASTM F-710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   5. ASTM F-1066 - Vinyl Composition Floor Tile.
   9. ASTM F-1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
12. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work of this Trade Contract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
   2. Coordinate the work of this Section with the respective trades responsible for installing interfacing work.

B. Sequencing:
   1. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Trade Contract, have been received and approved by the Architect.
   2. Sequence work to ensure resilient flooring is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, wet work is dry and cured, and work overhead is completed.
   3. Ensure that installation of flooring and accessories occurs after other finishing operations, including painting.

C. Scheduling:
   1. Phasing: Refer to Section 011000 - SUMMARY, and Drawings for phasing and milestone completion requirements which affect the Construction Manager’s Work and the Work of this Trade Contract.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.
      a. Furnish manufacturer's product literature on flooring adhesive, highlight adhesive properties, including VOC's and maximum moisture pressure limits for substrates.
   2. Shop drawings: 1/4 inch scale plans of each flooring area scheduled for Work of this Section. Drawings shall bear dimensions of actual measurements taken at the project.
      a. Identify each flooring type, colors and patterns, indicate layout of tile units and direction of tile patterns.
      b. Where more than one adhesive type is specified or otherwise required by flooring manufacturer, identify on shop drawings areas for each adhesive type.
   4. Verification samples:
      a. Full sized flooring tile, illustrating color, and pattern for each color and type of tile selected.
      b. Edging: 12 inches long demonstrating profile, thickness, size and color.
   5. Certificates:
      a. Submit the manufacturer’s certification that the resilient flooring has been tested by an independent laboratory and complies with the required fire tests.

B. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
   1. Operation and Maintenance Data: Furnish cleaning and maintenance data.
   2. Bonds and Warranty Documentation:
      a. Manufacturer’s Warranties and Guarantees as specified elsewhere herein this Section.
C. Maintenance Material Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.
   1. Extra Stock Materials: Upon completion of the Work of this Section, deliver to the Owner extra flooring materials for future repairs and maintenance, from the same manufacturing runs as those installed, in the following amounts.
      a. Vinyl composition tile: 3 percent of each material in each color, and pattern installed.
      b. Furnish a quantity of adhesive of each type used in sealed cans or containers sufficient to apply the above materials.

1.6 QUALITY ASSURANCE
A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
   1. Provide types of resilient tile and accessories supplied by one manufacturer, including leveling and patching compounds, and adhesives.
   2. Avoid color and pattern differential; provide flooring from one production run in any single room or contiguous areas.

1.7 MOCK-UPS
A. Provide mock-up under provisions of Section 014000 - QUALITY REQUIREMENTS.
B. Provide mock-up areas using accepted paint colors, minimum 50 square feet, illustrating color, texture and finish, and demonstrating the minimum standard for the Work.
C. Locate mock-ups where directed and include all surfaces and materials scheduled to receive a field applied finish.
D. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
E. Accepted mock-ups may [not] remain as part of the work; the number of mock-ups shall not be restricted.

1.8 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
   1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
   2. Deliver resilient flooring materials in original, unopened packages and store protected for three days prior to installation in area of installation to achieve temperature stability.
B. Storage and Handling Requirements:
   1. Store and handle materials following manufacturer’s recommended procedures, and in accordance with material safety data sheets. Store materials in a clean dry, enclosed space off the ground and protected from the weather
   2. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
   3. Protect adhesives from freezing.

1.9 SITE CONDITIONS
A. Maintain uniform temperature of minimum of 65 degrees Fahrenheit and humidity of 20 to 40 percent 48 hours prior to, during, and 48 hours after installation. Store resilient flooring materials and accessories in the spaces where they will be installed for at least 48 hours before beginning installation. Thereafter, maintain a minimum temperature of 55 degrees Fahrenheit in the areas where the work is completed.

1.10 WARRANTY
A. General: Submit warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS.
B. Manufacturer Warranty: provide manufacturer’s standard wear warranties for all flooring and stair tread materials installed under this Section.

**PART 2 - PRODUCTS**

2.1 VINYL COMPOSITION TILE

A. Basis of Design (RT-1A, RT-1B, RT-1C): Armstrong Flooring, product “Premium Excelon Crown Texture” non-directional tone on tone VCT consisting of the following physical characteristics:

1. Size: 12 inches by 12 inches (305 mm by 305 mm).
2. Color: As selected by Architect unless otherwise indicated on the Drawings.
4. Tiles per Carton/Coverage: 45 - 45 ft² (4.18 m²).
5. Shipping Weight per Carton: Approximately 63 lbs./carton (28.6 kg).
7. Chemical Resistance (ASTM F 925): No more than slight change in surface dulling, attack or staining - Meets.
9. Static Load Limit @ 125 psi (ASTM F 970): <0.005 inches - Meets.
10. Static Load Resistance (ASTM F 970) Less than 0.005 in. - 2000 psi.
11. Fire Test Data – Flame Spread (ASTM E 648) 0.45 W/cm² or more Class I - Meets.

2.2 ACCESSORIES

A. Filler for patching, smoothing and leveling subfloors and underlayments: Portland cement-based latex underlayment acceptable to flooring manufacturer, equal to the following:

1. Ardex, Inc., products “Feather Flash” and “Ardex SD-P”.
2. Quikrete Companies, product “Fast-Set Underlayment 1248”.

B. Adhesives:

1. General: Water resistant, as required or recommended by the resilient flooring manufacturer for substrate conditions to provide a complete and warranted flooring system.

C. Transition and edge strips:

2. Edge strips: Tapered or bull nose edge.
3. Colors: Match or contrast with the flooring, as selected by the Architect from standard colors available, of width shown on the drawings.

D. Cleaning material: Domestic neutral floor detergent having a pH 7 or pH 8, as recommended by the flooring manufacturer.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.

1. Verify concrete substrate has been cured and is sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture test.
   a. Insure that concrete substrate has a moisture content of not more than 3.5 percent by weight. Perform moisture test in several locations using carbide method dampness meter.
2. Beginning of installation means acceptance of existing substrate and site conditions.
3.2 PREPARATION
   A. General: Comply with flooring manufacturer's requirements for preparation of substrate to receive resilient flooring.
      1. Close spaces to traffic during the installation of the flooring.
   B. Protection of In-situ Conditions: During the operation of work of this Section, protect surrounding materials and finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing surfaces which are soiled or otherwise damaged by Work of this Section, to match indicated profiles and specified finishes. Materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work in conformance with the Contract Documents.
   C. Surface Preparation:
      1. Remove by mechanical means (light sanding and grinding), all protruding edges, high spots. Ensure that substrate is free from paint, varnish, wax, oil, or other foreign matter. Do not use solvents.
      2. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler. Apply, trowel and float finish subfloor filler and leave a smooth, level, hard surface. Prohibit traffic from area until filler is cured.
      3. Apply troweled subfloor filler and leveler to provide finished concrete surface smooth, with no more than 1/8 inch variation from plane within 10 feet in any direction.
         a. Prohibit traffic until filler and leveler is cured.
      4. Vacuum clean substrate, and ensure that substrate is dry, clean and smooth prior to application of flooring.

3.3 INSTALLATION - GENERAL
   A. Install all products in strict accordance with each manufacturer's written installation procedures and other provisions specified herein.
      1. Apply primers as recommended by adhesive manufacturer's written instructions.
   B. Spread only enough adhesive to permit installation of materials before initial set.
   C. Mix tile to ensure that concentration of surface patterns is uniform throughout. Use tile from cartons in same sequence as manufactured and packaged, if so numbered.
   D. Maintain reference markers, holes and openings that are in place or have been marked for future cutting; repeat markers on flooring as marked on substrate. Use non-permanent marking devices which may be cleaning washed off when no longer required.

3.4 INSTALLATION - FLOOR TILE
   A. Lay flooring in a square grid pattern, with joints and seams parallel to building lines. Lay tile flooring in pattern as indicated on the drawings with pattern-grain running in singular direction. Lay tile with joints straight and continuous in both directions and with border tile not less than 1/2 the width of the tile.
   B. Neatly fit resilient materials to all intersecting surfaces, and make joints as inconspicuous as possible.
   C. Terminate flooring at centerline of door in closed position where adjacent floor finish is of different material or color.
   D. Apply resilient materials to have uniform contact with receiving surfaces throughout, with tight joints, and with all finish surfaces smooth, in true plane, free from buckles, waves, and other imperfections.
   E. Extend resilient flooring to wall lines beneath all movable equipment and movable casework. Fit resilient flooring onto breaks and recesses, against non-resilient bases, around pipes and other protrusions, under saddles, and to and around other fixed surfaces, making neat cuts in the flooring and minimizing joints.
3.5 INSTALLATION OF ACCESSORIES
   A. Resilient edge and transition strips:
      1. Install edge strips at all edges of flooring which would otherwise be exposed.
      2. Place resilient edge strips tightly butted to flooring and secure with adhesive
         recommended by the edge strip manufacturer.

3.6 PROTECTION
   A. General: Protect finished work under provisions of Section 015000 - TEMPORARY FACILITIES
      AND CONTROLS.
   B. Prohibit traffic on finished floor areas until flooring adhesive has fully set.
   C. Prohibit washing, scrubbing or other similar ‘wet’ operations to occur on finished floor areas for
      a minimum period of 5 calendar days after installation.
   D. Provide protection of completed flooring areas from construction traffic until Substantial
      Completion of the General Contract. After cleaning and polishing, cover all resilient tile floor
      surfaces with non-staining heavyweight kraft paper and overlay with red-rosin paper, taping the
      edges to maintain position of the protection paper. Reapply papers as required to maintain floor
      protection.

END OF SECTION
SECTION 096723
RESINOUS FLOORING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This section includes the following:
      1. Resinous flooring system as shown on the drawings and in schedules.
         a. Related sections include the following: Division 03 - Concrete.

1.3 SYSTEM DESCRIPTION
   A. The work shall consist of preparation of the substrate, the furnishing and application of a
      cementitious urethane based self-leveling seamless flooring system with Macro or Micro size
      decorative colored chip broadcast, epoxy resin broadcast and aliphatic resinous topcoat.
   B. The system shall have the color and texture as specified by the Owner with a nominal
      thickness of 3/16 inch. It shall be applied to the prepared area(s) as defined in the plans strictly
      in accordance with the Manufacturer's recommendations.
   C. Cove base (if required) to be applied where noted on plans and per manufacturers standard
      details unless otherwise noted

1.4 SUBMITTALS
   A. Product Data: Latest edition of Manufacturer's literature including performance data and
      installation procedures.
   B. Manufacturer's Material Safety Data Sheet (MSDS) for each product being used.
   C. Samples: 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall
      be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE
   A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and
      technical support of epoxy and urethane industrial flooring and related materials.
      1. The Applicator shall have experience in installation of the flooring system as confirmed by
         the manufacturer in
      2. all phases of surface preparation and application of the product specified.
   B. No requests for substitutions shall be considered that would change the generic type of the
      specified System.
   C. System shall be in compliance with requirements of United States Department of Agriculture
      (USDA), Food, Drug Administration (FDA), and local Health Department.
      1. A pre-installation conference shall be held between Applicator, General Contractor and
         the Owner to review and clarification of this specification, application procedure, quality
         control, inspection and acceptance criteria and production schedule.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING
   A. Packing and Shipping:
      1. All components of the system shall be delivered to the site in the Manufacturer's
         packaging, clearly identified with the product type and batch number.
   B. Storage and Protection:
      1. The Applicator shall be provided with a dry storage area for all components. The area
         shall be between 60 F and 85 F, dry, out of direct sunlight and in accordance with the
         Manufacturer's recommendations and relevant health and safety regulations.
2. Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

C. Waste Disposal:
1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS
A. Site Requirements:
1. Application may proceed while air, material and substrate temperatures are between 60 F and 85 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
3. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.

B. Conditions of new concrete to be coated with cementitious urethane material.
1. Concrete shall be moisture cured for a minimum of 3 days and have fully cured a minimum of 5 days in accordance with ACI-308 prior to the application of the coating system pending moisture tests.
2. Concrete shall have a flat rubbed finish, float or light steel trowel finish (a hard steel trowel finish is neither necessary nor desirable).
3. Sealers and curing agents should not to be used.
4. Concrete shall have a minimum design strength of 3.500 psi. and a maximum water/cement ratio of 0.45.
5. Concrete surfaces on grade shall have been constructed with a vapor barrier to protect against the effects of vapor transmission and possible delamination of the system.

C. Safety Requirements: The Owner shall be responsible for the removal of foodstuffs from the work area. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY
A. The manufacturer warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Dur-A-Flex, Inc. published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.

B. The manufacturer’s liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 - PRODUCTS
2.1 MANUFACTURER
A. Specified Manufacturer (CMP-1): To establish a standard of quality, design and function desired, Drawings and specifications have been based on Dur-A-Flex, Inc., East Hartford, CT, Product: "Dur-A-Quartz" decorative quartz seamless flooring system consisting of 100% solids epoxy with a chemical and wear resistant urethane topcoat. No substitution will be accepted.

2.2 MATERIALS
A. System Materials:
3. The quartz aggregate shall be Dur-A-Flex, Inc. Q-28 or Q-11 colored quartz aggregate.

B. Patch Materials:
2.3 PRODUCT REQUIREMENTS

A. Primer: Dur-A-Glaze #4 WB:
   1. Percent Solids: 56 %
   2. VOC: 2 g/L
   3. Bond Strength to Concrete ASTM D 4541:550 psi, substrates fails
   4. Hardness, ASTM D 3363: 3H
   5. Elongation, ASTM D 2370: 9 %
   6. Flexibility (1/4: Cylindrical mandrel), ASTM D 1737:Pass
   8. Abrasion Resistance ASTM D 4060, CS 17 wheel, 1,000 g Load: 30 mg loss

B. Broadcast, and Grout Coat: Dur-A-Glaze #4:
   1. Percent Solids: 100 %
   2. VOC: 3.8 g/L
   3. Compressive Strength, ASTM D 695: 17,500 psi
   4. Tensile Strength, ASTM D 638: 2,100 psi
   5. Flexural Strength, ASTM D 790: 5,100 psi
   6. Abrasion Resistance, AS TM D 4060, C-10 Wheel, 1,000 gm load, 1,000 cycles: 29 mg loss
   7. Flame Spread/NFPA-101, ASTM E 84: Class A
   8. Impact Resistance MIL D-24613: 0.0007 inches, no cracking or delamination
   9. Water Absorption. MIL D-24613: Nil
   10. Potlife @ 70 F: 20 minutes

C. Topcoat: Armor Top:
   1. Percent Solids: 95 %
   2. VOC: 0 g/L
   3. Tensile Strength, ASTM D 2370: 7,000 psi
   4. Adhesion, ASTM 4541: Substrate Failure
   5. Hardness, ASTM D 3363: 4H
   6. 600 Gloss ASTM D 523: 70
   7. Abrasion Resistance, ASTM D4060 Gloss Satin
       CS 17 wheel (1,000 g load) 1,000 cycles 4 8 mg loss with grit
       12 mg loss without grit
   9. Pot Life, 70 F, 50% RH: 2 Hours
   10. Full Chemical Resistance: 7 days

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting flooring performance.
   1. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements specified.

3.2 PREPARATION

A. General:
   1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
   2. Moisture Testing: Perform tests recommended by manufacturer and as follows.
      a. Perform anhydrous calcium chloride test ASTM F 1869-98. Application will proceed only when the vapor/moisture emission rates from the slab is less than and not higher than 20 lbs/1,000 sf/24 hrs.

RESINOUS FLOORING
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b. Perform relative humidity testing using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.

c. If the vapor drive exceeds 99% relative humidity or 20 lbs/1,000 sf/24 hrs then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.

3. Mechanical surface preparation
a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.

b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.

c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 1/4 inch key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.

d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer’s recommendations.

4. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufactures recommendations.

3.3 APPLICATION

A. General:
1. The system shall be applied in five distinct steps as listed below:
   a. Substrate preparation
   b. Priming
   c. First broadcast coat application with first aggregate broadcast
   d. Second broadcast coat with second aggregate broadcast
   e. Grout coat application, sand floor (if required)
   f. First topcoat application
   g. Second topcoat application

2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.

3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer’s recommendations.

4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.

5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Primer
1. The primer shall consist of a liquid resin and hardener that is mixed at the ratio of 1 part resin to 4 parts hardener per the manufacturer’s instructions.

2. The primer shall be applied by 1/8 inch notched squeegee and back rolled at the rate of 200 sf/gal to yield a dry film thickness of 4 mils.

C. Broadcast Coat
1. The broadcast coat shall be applied as a double broadcast system as specified by the Architect.
2. The broadcast coat shall be comprised of two components, a resin, and hardener as supplied by the Manufacturer and mixed in the ratio of 2 parts resin to 1 part hardener.
3. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
4. The broadcast coat shall be applied over horizontal surfaces using "v" notched squeegee and back rolled at the rate of 90-100 sf/gal.
5. Colored quartz aggregate shall be broadcast to excess into the wet material at the rate of 0.5 lbs/sf.
6. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.
7. Apply a second coat of resin with a coverage rate of 90 sf/gal (Q28) or 50 sf/gal (Q11), and broadcast aggregate to excess at the rate of 0.5 lbs/sf.
8. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

D. Grout Coat
1. The grout coat shall be comprised of liquid components, combined at a ratio of 2 parts resin to 1 part hardener.
2. The grout coat shall be squeegee applied with a coverage rate of 90 sf/gal (Q28) or 50 sf/gal (Q11) by volume and shall be thoroughly blended by mechanical means such as a high speed paddle mixer.
3. The grout coat will be back rolled and cross rolled to provide a uniform texture and finish.
4. If an orange-peel texture is required, sand screen the floor and apply a second grout coat of epoxy. The epoxy shall be applied by squeegee and back-roll with a coverage rate of 200 sf/gal (Q28) or 70 sf/gal (Q11).

E. Topcoat
1. The topcoat of Armor Top shall be roller applied at the rate of 500 sf/gal to yield a dry film thickness of 3 mils.
2. The topcoat shall be comprised of a liquid resin, hardener and grit that is mixed per the manufacturer’s instructions.
3. The finish floor will have a nominal thickness of 1/8 inch (Q28) or 3/1 inch (Q11).

3.4 FIELD QUALITY CONTROL
A. Tests, Inspection
   1. The following tests shall be conducted by the Applicator:
      a. Temperature:
         1) Air, substrate temperatures and, if applicable, dew point.
      b. Coverage Rates:
         1) Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION
A. Cure flooring material in compliance with manufacturer’s directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
B. Remove masking. Perform detail cleaning at floor termination, to leave cleanable surface for subsequent work of other sections.

END OF SECTION
SECTION 096813
TILE CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Carpet tile, fully adhered over floors, where indicated on the Drawings, including all accessories necessary to complete the work.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 015000 - TEMPORARY FACILITIES AND CONTROLS: Application of protection paper to finished resilient flooring.
C. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
D. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
E. Section 024100 - DEMOLITION: Removal of existing floor finishes.
F. Section 090506 - COMMON WORK RESULTS FOR FLOORING: General requirements for flooring preparation, installation and temporary protection.
G. Section 062000 - FINISH CARPENTRY: Installing metal thresholds.
H. Section 096513 - RESILIENT BASE AND ACCESSORIES: Resilient base.
I. Section 096519 - RESILIENT TILE FLOORING: Resilient tile flooring.
J. Section 096723 - RESINOUS FLOORING: Troweled seamless epoxy flooring system

1.3 REFERENCE STANDARDS
A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
5. CRI Indoor Air Quality Testing and Labeling Program.
7. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
B. Pre-installation Meetings: Installer of the Work of this Section is required to attend pre-installation conference specified under Section 090506 - Common Work Results for Flooring.
C. Sequencing:
   1. Remove and replace existing carpet in accordance with a pre-approved reuse and/or recycling plan.

1.5 SUBMITTALS

A. Submit the following under provisions of Section 013000 - Administrative Requirements:
   1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, for each item furnished hereunder, including carpet, accessories, adhesives, and leveling materials.
   2. Manufacturer's installation instructions: Provide manufacturer's application methods or installation instructions for each item furnished hereunder. Indicate special procedures, and perimeter conditions requiring special attention.
   3. Manufacturer's sample warranties.
   4. Manufacturer's certificate: Provide certificate stating that the carpet, and other related materials to be supplied hereunder meet all requirements specified herein.
      a. Submit certification from the fiber producer verifying use of the branded fiber in the submitted carpet product.
   5. Indoor Air Quality Test Reports: Submit for specified products, indicating that the test results do not exceed the stated emission criteria of the CRI Indoor Air Quality Testing Program.
   6. Shop drawings: 1/8 inch scale plans of all carpeted areas indicating direction of carpet, location of seams and method of joining seams.
      a. Show location of different patterns or styles of carpet.
   7. Selection samples:
      a. Sample swatches containing manufacturer's full color and blend range.
      b. Vinyl edge strip sample illustrating manufacturer's full color range.
   8. Verification samples:
      a. 12 inch long samples of edge strip.
      b. After initial selection of carpet and color blends has been made by the Architect: 18 inches by 27 inches sample of selected carpet for final approval of the Architect. Approved samples shall be used as the standard of quality and colors for materials furnished under this Contract.

B. Submit the following under provisions of Section 017800 - Closeout Submittals:
   1. Maintenance Data: Prior to Project Substantial Completion, deliver to the Architect copies of the carpet manufacturer's detailed maintenance recommendations for the care cleaning and stain-removal, and repair of the types of carpets installed. Include product data and Material Safety Data Sheets (MSDS) for cleaning materials.

C. Maintenance Material Submittals: Submit the following under provisions of Section 017800 - Closeout Submittals. Clearly label and package extra materials securely to prevent damage.
   1. Extra Materials: Upon completion of the Work of this Section, Deliver to the Owner extra materials for future repairs and maintenance. Clearly label and package securely to prevent damage.
      a. Owner's carpet tile stock: An amount equal to 3 percent of each color, pattern and type of carpet installed.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Mill specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in carpet installation of the type specified herein with a minimum three years documented experience and approved by carpet tile manufacturer.
ENVIRONMENTAL CONDITIONS

A. Do not install carpet until areas have been fully enclosed and environmental conditions have reached the levels indicated during occupancy.

B. Store materials for 3 days (72 hours) prior to installation in area of installation to achieve temperature and humidity stability. Carpet and adhesive must be stored at a minimum temperature of 68 degrees F.

C. Maintain a temperature of at least 60 degrees Fahrenheit, with a relative humidity of between 15 and 60 percent, for a period of 72 hours before, during, and after installation.

D. Ventilate spaces where work of this Section occurs, during and for a period of 72 hours after completion of carpet installation. Ventilate to dissipate humidity, and to prevent accumulation of fumes, vapors, and gases. Provide temporary fan units and ducting as required for venting operations.

DELIVERY, STORAGE, AND HANDLING

A. Store all carpeting material under cover in dry, well-ventilated spaces as soon as delivered. Protect carpeting from damage, dirt, stain, moisture, and mildew.

WARRANTY

A. Furnish the following warranties under provisions of Section 017800 - Closeout Submittals:
   1. Furnish carpet installer's written guarantee covering prompt and proper replacement of any and all carpeting which indicates improper installation workmanship and/or defective material within twelve months from completion of the installation and acceptance thereof by the Architect, said corrective work being performed by the Carpet installer at no cost to the Owner.
   2. Furnish carpet manufacturer’s warranty which shall contain the following:
      a. Commencement date for warranty: Date of Project Substantial Completion.
      b. Wear Warranty - Lifetime of Carpet. No more than 10% face yarn loss by weight in normal use.
      c. Static Warranty - Lifetime of Carpet.
      d. Edge Ravel Warranty - Lifetime of Carpet. Guaranteed no edge ravel in normal use (no seam sealers required).
      e. Delamination Warranty - Lifetime of Carpet. Guaranteed no delamination in normal use (no chair pads required).
      f. Tuft Bind Warranty - Lifetime of Carpet. Guaranteed not to zipper, wet or dry.

PART 2 - PRODUCTS

CARPET TILE

A. General requirements: Carpet tiles, shall conform with or pass tests of the following Standards:
   1. ASTM D-2859 (Methenamine Reagent Pill Test).
   2. ASTM E-648 (Flooring Radiant Panel Test): Class I (Minimum Average CRF of 0.48).
   3. NBS Smoke Chamber Test: Maximum average of 450.
   4. AATCC-134 (Electrostatic Propensity): Maximum electrostatic generation below level of human sensitivity.

MANUFACTURERS

A. Specified Manufacturer (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on Mohawk Industries Inc., Calhoun, GA, www.mohawk.com

MATERIALS

A. Basis of Design (CPT-1A): Mowhawk Group, product “Urban Passage”, consisting of the following physical characteristics:
   1. Color: As selected by Architect unless otherwise indicated on the Drawings.
2. Size: Size: 12 inches by 36 inches (.3048 m x .9144 m).
3. Tufted Pile Weight: 35 oz/yd2 (1187 g/m2).
7. Gauge: 1/12 (47.00 rows per 10 cm).
10. Stitches Per Inch: 8.5 (33.46 per 10 cm).
11. Finished Pile Thickness: .109" (2.77 mm).
13. Backing Material: EcoFlex NXT.
14. Fiber Type: Duracolor® Tricor Premium Nylon.
15. System. Passes GSA requirements for permanent stain resistant carpet.
17. Installation Method: As selected by Architect unless otherwise indicated on the Drawings.
22. Static: AATCC-134 Under 3.5 KV.
23. Flammability: ASTM E 648 Class 1 (Glue Down).

B. Basis of Design (CPT-1B&C): Mowhawk Group, product “Urban Fringe”, consisting of the following physical characteristics:
1. Color: As selected by Architect unless otherwise indicated on the Drawings.
2. Size: Size: 12 inches by 36 inches (.3048 m x .9144 m).
3. Tufted Pile Weight: 36 oz/yd2 (1221 g/m2).
7. Gauge: 1/12 (47.00 rows per 10 cm).
10. Stitches Per Inch: 8.6 (33.86 per 10 cm).
11. Finished Pile Thickness: .109" (2.77 mm).
13. Backing Material: EcoFlex NXT.
14. Fiber Type: Duracolor® Tricor Premium Nylon.
15. System. Passes GSA requirements for permanent stain resistant carpet.
17. Installation Method: As selected by Architect unless otherwise indicated on the Drawings.
22. Static: AATCC-134 Under 3.5 KV.
23. Flammability: ASTM E 648 Class 1 (Glue Down).

C. Check matching of carpet before installation and ensure there is no visible variation between dye lots.
2.4 ACCESSORIES

A. Adhesives for carpet tile: NFPA Class A or UBC Class 1 types, as determined by ASTM E-84 Tunnel Test, as recommended by Carpet manufacturer for application and intended use. Acceptable manufacturers include:
   1. Advanced Adhesive Technology, Inc, Dalton, GA.
   2. DAP Incorporated, Dayton, OH.
   4. Macklanburg-Duncan Company, Oklahoma City, OK.
   5. Roberts Consolidated Industries, Inc., City of Industry, CA.

B. Transition strips, carpet reducers, edgings and accessories: Homogeneous vinyl, in colors as selected by the Architect.
   1. Acceptable manufacturers:
      a. Johnsonite, Middlefield, OH.
      b. Burke-Mercer Flooring Products (Division of Burke Industries), San Jose, CA.
      c. Roppe Corporation, Fostoria, OH
      d. Vinyl Products Inc., Floor Products Division, Sheboygan, WI.
   2. Transition strips: equal to Johnsonite model: CRS-XX series reducer (exact model number dependent on height of carpet tile.)

C. Filler for patching, smoothing and leveling subfloors and underlayments: Portland cement-based latex underlayment acceptable to flooring manufacturer, equal to the following:
   1. Ardex, Inc., products “Feather Flash” and “Ardex SD-P”.
   2. Quikrete Companies, product “Fast-Set Underlayment 1248”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   1. Do not proceed with flooring installation if base cabinets, or other built-in casework is present on the substrate.

B. Ensure that newly placed concrete has cured for a minimum period of 30 days and that moisture content of concrete is within range specified by adhesive manufacturer.

C. Verify that surfaces are smooth and flat with a maximum variation of 1/4 inch in 10 feet, and are ready to receive work.

D. Request correction of defects in receiving surfaces which are not correctable by the methods specified herein. Do not commence work until such defects are entirely corrected. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Preheat areas to receive carpet to a minimum temperature of 60 degrees F for 72 hours prior to installation, with a relative humidity between 15 and 60 percent. Maintain minimum temperature of 60 degrees F thereafter.

B. Remove sub-floor ridges, and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

C. Apply, trowel, and float filler to leave smooth, flat and hard surface, as required to ensure that carpeted surfaces will be level to within 1/8 inch tolerance in 10 feet in any direction.

D. Prohibit traffic until filler is cured.

E. Thoroughly sweep and vacuum substrate and remove all foreign matter.

F. Measure all areas to receive materials to be furnished and installed hereunder, and verify in the field their actual dimensions, including wall-to-wall dimensions, offsets, door locations, and
details, fixed equipment, and all other installed items. Extra charges will not be allowed because of lack of familiarity with actual project conditions. Small pieces of carpet will not be acceptable.

3.3 INSTALLATION

A. Install carpet tile in accordance with carpet and adhesive manufacturers’ instructions. Immediately notify Architect of conflicts. Cement carpet directly to the substrate with specified installation adhesive. Trowel adhesive evenly on the substrate. Install the carpet within thirty minutes after spreading adhesive.

B. Lay carpet tile in a square grid pattern, with joints and seams parallel to building lines. Lay joints straight and continuous in both directions and with border carpet tile not less than 1/2 the width of the tile.
   1. Install all carpet tile with pattern running the same direction in a single room or contiguous space. Confirm direction of carpet pattern with Architect prior to installation.

C. Install specified edging wherever carpeting abuts a dissimilar flooring material, except where wood thresholds, or resilient floor tile trim occurs.

3.4 CLEANING

A. Protect finished work under provisions of Section 090506 - COMMON WORK RESULTS FOR FLOORING.

B. Remove excess adhesive without damage, from floor, base, and wall surfaces.

C. Clean and vacuum carpet surfaces upon completion of the installation.

D. Prohibit traffic from carpet areas for 24 hours after installation. Protect with carpet with non-staining cover until Owner’s final acceptance.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. Rigid vinyl sheet wall covering.
   B. Adhesive, accessories, and trim.

1.2 RELATED REQUIREMENTS
   A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
   B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
   C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

1.3 REFERENCES

1.4 SUBMITTALS
   A. See Section 013000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Product Data: Manufacturer's complete and current product information, including installation instructions showing mounting details and recommended adhesives.
   C. Shop drawings: Show locations of joints, extent of wall covering and installation details. Show methods of attachment to adjoining construction.
   D. Certificate: Submit certification by manufacturer that products to be furnished comply with the requirements of this specification.
   E. Selection Samples: Color charts consisting of actual product pieces, illustrating full range of colors and textures available, for initial color selection.

1.5 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
   B. Installer Qualifications: Installer specializing in performing the work of this section and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Deliver to project site in manufacturer's packaging, properly labeled.
   B. Store materials flat in a clean, dry area.
1.7 PROJECT CONDITIONS
   A. Field Measurements: When project conditions permit, take field measurements of areas where assemblies will be located; note discrepancies between drawings and actual dimensions on submitted shop drawings.

1.8 ENVIRONMENTAL REQUIREMENTS
   A. Maintain storage temperature at or above 50 degrees F (10 degrees C).
   B. Acclimatize materials and bring surfaces to receive wall covering to a temperature between 65 and 85 degrees F (18 and 29 degrees C) for not less than 48 hours prior to installation.
   C. Maintain surfaces to receive wall covering at a temperature between 65 and 85 degrees F (18 and 29 degrees C) during installation.
   D. Maintain relative humidity at 80 percent or less during installation.
   E. Do not expose walls to direct sunlight for 48 hours after installation to avoid high temperatures that could cause blistering or distortion.

1.9 MAINTENANCE MATERIALS
   A. See Section 016000 - Product Requirements, for additional provisions.
   B. Provide maintenance materials comprising 5 percent, but not less than two complete sheets of each type of wall covering installed, for use by Owner.

PART 2 - PRODUCTS
2.1 BASIS OF DESIGN MANUFACTURER
   A. Basis of Design (Specified Manufacturer): To establish a standard of quality, design and function desired, Drawings and specifications are based on Koroseal Wall Protection Systems, Muncy, PA, product Korogard.

2.2 PRODUCT
   A. Wall Covering (WP-1): Rigid high impact sheet, extruded, textured, chemical-and stain-resistant, high-impact, acrylic modified vinyl plastic, Class A fire rating, consisting of the following:
      1. Sheet size: Standard: 4 feet by 8 feet.
      2. Color: As selected by Architect unless otherwise indicated on the Drawings.
      3. Thickness: .060 inches.

2.3 ACCESSORIES
   A. Trim: Extruded material to match wall covering; provide all necessary trim members in color matching wall covering. Provide the following in standard lengths:
      1. Top caps: "J" molding.
      3. For back-of-house areas only.
      4. Inside corners.
      5. Outside corners.
      6. Saratoga vertical and horizontal 2 inch wide trim.
   B. Adhesives: As recommended or supplied by manufacturer of high impact wall covering.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Verify that walls are in proper condition to receive installation of high impact wall covering.
   B. Verify that environmental conditions specified herein have been achieved and can be maintained.
3.2 PREPARATION
   A. Clean substrate to remove dust, debris and loose particles.

3.3 INSTALLATION
   A. Install high impact wall covering in full compliance with manufacturer's installation instructions; arrange for manufacturer's representative to review installation instructions with installer prior to starting work.
   B. Follow manufacturer's instructions regarding sheet size, use of rolled material, maximum dimension between seams, and adhesive application.
   C. Install panels with expansion gap of 1/16 inch (1.6 mm) between sheets, at door frames, baseboards, and other fixed elements. Cut oversized holes when installing fixtures through wall covering.
   D. Install with vertical seams plumb and horizontal seams level.
   E. Provide special curved cuts as indicated using templates and laser cutting tools.
      1. Do not install trim on laser cut curved edges.
   F. Wood grain pattern to be installed in a vertical direction unless otherwise indicated.

3.4 CLEANING
   A. Clean wall covering and accessories of adhesive and other surface blemishes, using materials and methods recommended by manufacturer.

3.5 PROTECTION
   A. Protect installed units after installation from damage from construction operations.
   B. If damage occurs, remove and replace damaged components or entire unit as required to provide unit in its original, undamaged condition.
SECTION 098100
ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. The work of this Section consists of acoustical insulation where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.
B. Furnish and install:
   1. Acoustical insulation as scheduled and where indicated on the Drawings.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 024100 - DEMOLITION: Removal of existing partitions, walls and related insulation.
E. Section 061000 - ROUGH CARPENTRY: Wood blocking, nailers.
F. Section 092216 - NON-STRUCTURAL METAL FRAMING.
G. Section 092900 - GYPSUM BOARD: Installation of wall board over acoustical insulation.
H. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Ductwork and piping insulation.

1.3 REFERENCES
A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - References. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1.4 SUBMITTALS
A. Information and Review Submittals: Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:
   1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
   2. Certificates:
      a. Provide manufacturer's written certification of recycled slag content in mineral wool insulation.

1.5 DELIVERY, STORAGE AND HANDLING
A. Delivery and Acceptance Requirements:
   1. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
   2. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
B. Storage and Handling Requirements:
   1. Store materials under cover and in manner to keep them dry, protected from weather, direct sunlight and damage from construction traffic and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following:
   1. Acoustical mineral fiber insulation:
      a. Fibrex Insulations Inc., Sarnia, Ontario
      b. Thermafiber Inc., Wabash, IN.

2.2 MATERIALS

A. Acoustical batt insulation: Mineral wool fiber insulation batts, conforming to ASTM C665 Type 1, and ASTM C553 with a nominal density of 2.5 pounds per cubic foot, nominally 3-1/2 inches thick unless otherwise noted in the Drawings.
   1. Flame Spread Classification: Class A (less than 25, per testing by NFPA 255, ASTM E-84 or UL 723).
   2. Recycled content of slag in mineral wool insulation: Use maximum available percentage of material (slag). Mineral wool insulation products incorporated into the work shall contain not less than 75 percent of recycled material (slag) by weight.
   3. Acceptable products include:
      a. Fibrex Insulations Inc. product: “Fibrex Sound Attenuation Fire Batt (SAFB)”.
      b. Roxul, Inc., product “Roxul AFB”.
      c. Thermafiber, Inc. product “Thermafiber SAFB”.

B. Staples, tape, adhesives and fasteners required for the proper and complete installation for work of this Section shall be as recommended by each respective manufacturers of each insulation type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install insulation in accordance with insulation manufacturer’s instructions.

B. Install in interior walls, and ceiling spaces where indicated. Trim insulation neatly to fit spaces. Fit insulation tight in spaces. Leave no gaps or voids.

3.2 CLEANING

A. Daily clean work areas by sweeping and disposing of debris and scraps.

B. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.

END OF SECTION
SECTION 098413
ACOUSTIC FABRIC PANELS

PART 1 - GENERAL

1.1 SUMMARY
A. Furnish and install:
   1. Tackable mineral fiber panels.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 061000 - ROUGH CARPENTRY: Wood blocking behind wall panels.
E. Section 092900 - GYPSUM BOARD: Preparation of adjacent work to receive work of this Section.

1.3 REFERENCES
E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films: This test normally applies for textiles not directly applied to a substrate.

1.4 PERFORMANCE REQUIREMENTS
A. Fire Retardant Classification: Class A, to ASTM E84.
   1. Fire-Testing Response Characteristics: Provide acoustical wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical wall panels with appropriate markings of applicable testing and inspecting agency.
      a. Flame Spread: 25 or less.
      b. Smoke Developed: 450 or less.

B. Acoustic Attenuation (NRC) per ASTM C423, as required by manufacturer.
C. Minimum breaking load (N/lb.) per ASTM D5034-1, as required by manufacturer.
D. Fabric: High content of stable yarns, and acoustically transparent, where covering acoustical substrate.

1.5 SUBMITTALS
A. Submit the following per 013000 - ADMINISTRATIVE REQUIREMENTS:
   2. Shop Drawings: Identify panel sizes, panel configurations, track frame profiles, fabric selections by elevation, and corner details.
3. Samples: Submit one (1) sample, [300 x 300 mm (12 x 12 inch) size], including track frame, substrate and fabric. Sample will be reviewed for color, texture, fabric tautness, alignment and pattern of weave, fabric translucency, and appearance of corners.

1.6 QUALITY ASSURANCE
A. Manufacturer Qualifications: A firm experienced in manufacturing acoustical wall panels similar to those indicated for this Project and with a record of successful in service performance.
B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
C. Source Limitations for Acoustical Wall Panels: Obtain acoustical wall panels from one source with resources to provide products of consistent quality in appearance and physical properties.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.
B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.
C. Protect panel edges from damage.

1.8 PROJECT CONDITIONS
A. Environmental Limitations: Do not install acoustical wall panels until construction in spaces is complete and ambient temperature and humidity conditions are maintain at the levels indicated for Project when occupied for its intended use.
B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from color contamination of ambient air.
C. Field Maintenance: Verify wall surface dimensions by field measurements before fabrication and indicated measurements on Shop Drawings. Coordinate fabrication schedule with coordination progress to avoid delaying the Work.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, established surface dimensions and proceed with fabricating acoustical wall panels without field measurements. Coordinate wall construction to ensure that actual surface dimensions correspond to established dimensions.

1.9 WARRANTY
A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties make by Contractor under requirements of the Contract Documents.
B. Provide a five-year manufacturer's warranty against material defects.

PART 2 - PRODUCTS
2.1 WALL PANELS
A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Armstrong World Industries, www.armstrongworldindustries.com, Product: “SoundSoak 60 - FR-701”.
B. Refer to Section 016200 - PRODUCT SUBSTITUTIONS.

2.2 MATERIALS
A. Core: Mineral fiber.
B. Fabric: Guilford of Maine, product: “Hytex” or Carnegie Corporation, Inc, product: “Maharam”, in color, thickness & style as selected by the Architect from the manufacturer's full range of options.

C. Panel width: 30 inches.

D. Panel heights:
   1. 72", (06).
   2. 96", (08).
   3. 108", (09).
   4. 120", (10)

E. Acoustic performance:
   1. Thickness/NRC.
      a. 3/4"/ 0.70 NRC.
      b. 1"/ 0.80 NRC
      c. 1-1/8"/ 0.85 NRC
      d. 1-1/2"/ 0.95 NRC
      e. 2"/ 1.05 NRC
      f. 2-1/8"/ 0.95 NRC
      g. 3"/ 1.15 NRC
   2. STC Ratings:
      a. 1 sided panel = 43.
      b. 2 sided panel = 45.

F. Performance:
   1. Tested to ASTM E84 - 25/200.
   2. Tested to CAN/ULC SIO2 - 25/250 Composite.

2.3 FABRICATION

A. Fabricate panels to sizes and configurations indicated; where required, attach facing materials to cores to produce installed panels with visible surfaces fully covered and free from waves in fabric weave, wrinkles, sage, blisters, seams, adhesive, or other foreign matter.
   1. Fabricate back-mounted panels in factory to exact sized required to fit wall surfaces, based on field measurements of completed substrates indicated to receive acoustical wall panels.
   2. Where square corners are indicated, tailor corners.
   3. Where fabrics with directional or repeating patterns, or directional weave, are indicated, mark fabric top and attach fabric in same direction.
   4. Where fabric facings with seams are indicated, fabricate invisible seams and comply with Shop Drawings for location.
   5. Where radiused or mitered corners are indicated, install fabric to avoid seams or gathering of material.
   6. For panels suspended from ceiling, provide fabric covering both sides, with seams only at panel edges.

2.4 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal as follows:
   1. Z-clip hanger and magnet system with magnets recessed into panel frame and designed to engage steel mounting plates secured to substrate with screws.
   2. Impaling clips.
   3. Snap-on anchors.
PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine substrates and blocking with Installer present, for compliance with requirements for installation tolerances and other conditions affecting acoustical wall panel performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Do not proceed until surrounding environment is clean and dry. Maintain temperature, and humidity at conditions approximating those of occupancy prior to, during, and after installation.

C. Ensure substrate surface is smooth, flat, and taped and sealed [if drywall] prior to track installation. Directly adjoining work must be complete and dry.

D. Field measure areas to receive acoustic panels; establish exact layout of units.

3.2 INSTALLATION

A. Install acoustical panels in locations indicated, following installation recommendations of panel manufacturer. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

B. Install tracks plumb and level, and straight with fittings, flush to achieve panel configuration.

C. Fasten track frame in a consistent manner, minimum 25mm (1") on center.

D. Install acoustic substrate material, continuous to rear base of track or as shown if reflective, or diffusive.

E. Cut fabric from each roll, maintaining sequence of drops and matching direction of weave.


G. Install panels to the following construction tolerances:
   1. Plumb and level: plus or minus 1/16 inch.
   2. Flatness: plus or minus 1/16 inch.
   3. Width of joints: plus or minus 1/16 inch.

3.3 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer’s instructions.

B. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

C. Clip loose threads; remove pills and extraneous materials.

3.4 PROTECTION OF FINISHED WORK

A. Provide protection of installed acoustical panels until completion of the Work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect, before time of substantial completion.

END OF SECTION
SECTION 099100
PAINTING AND COATING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section Includes: This Section consists of painting work where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Painting work includes, but is not limited to, the surface preparation and application of coated finishes, and subsequent touch-up, of interior items and surfaces as indicated on the Contract Drawings and as scheduled herein.

B. Surfaces and Materials: In general, without limiting the generality thereof, the following surfaces, fixtures and equipment require a painted finish:
   1. New, existing and repaired gypsum board partition and wall surfaces, ceilings and soffits, including all surfaces disrupted and repaired in the process of installing new building systems and components.
   2. New and existing metal doors and frames.
   3. New and existing interior wood trim.
   4. Access panels and frames.
   5. Other items noted on the Drawings.

C. DO NOT PAINT the following surfaces and materials:
   1. Concealed from view surfaces, except as indicated otherwise in the Contract Documents or as specified herein.
   2. Chrome or nickel plating, stainless steel, bronze, brass.
   3. Aluminum other than mill finished or factory primed.
   4. Factory finished mechanical and electrical equipment, pumps, machinery and similar items which occur in mechanical, storage or equipment rooms or areas.
   5. Factory finished materials, specialties, and accessories unless otherwise specified.
   6. Ceramic tile, acoustical tile, resilient flooring, and other integrally finished floor, wall and ceiling finishes.
   7. Prefinished millwork items.
   8. Fire resistant testing and certification labels, code required labels, safety warning labels, performance rating plates, nomenclature plates, identification plates, and similar other labels.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 017329 - CUTTING AND PATCHING: Procedural and administrative requirements for cutting and patching.

E. Section 024119 - SELECTIVE DEMOLITION: Removal of existing finishes.

F. Section 062000 - FINISH CARPENTRY: Wood trim items, setting and filling of nails, sanding of wood trim.

G. Section 079200 - JOINT SEALANTS: Requirements for sealant and backing materials.

H. Section 081113 - HOLLOW METAL DOORS AND FRAMES: Shop priming of metal frames and steel doors.
I. Section 083100 - ACCESS DOORS AND PANELS: Shop primed access panels, occurring in partitions and walls.
J. Section 092900 - GYPSUM BOARD: Drywall partitions, ceilings and soffits, including joint treatment and sanding.
K. Section 099123 - INTERIOR PAINTING SCHEDULE.
L. Section 104400 - FIRE PROTECTION SPECIALTIES: Shop priming of cabinet doors and frames; shop finishing of cabinet.
M. Division 22 - PLUMBING: Prefinished items such as plumbing fixtures, sprinkler heads, convectors, anemostates and similar surfaces and materials.
N. Division 26 - ELECTRICAL: Prefinished items such as light fixtures, switch gear, electrical distribution cabinets and similar surfaces and materials.

1.3 REFERENCE STANDARDS
A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
   1. All applicable federal, state and municipal codes, laws and regulations for flammability and smoke generation of interior finishes.

B. Definitions:
   1. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials specified herein, whether used as prime, intermediate or finish coats.
   2. Sheen: Specular gloss readings in accordance with ASTM D16.
      a. Flat: less than 5 (measured at 85 degrees).
      b. Eggshell: 5 - 20 (measured at 60 degrees).
      c. Satin: 15-35 (measured at 60 degrees).
      d. Low Luster: 25 - 35 (measured at 60 degrees).
      e. Semi-Gloss: 30 -65 (measured at 60 degrees).
      f. Gloss: 65 or more (measured at 60 degrees).

1.4 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
   1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, material compositions, and application instructions for all finishing products to be applied hereunder.
      a. Include certification of data indicating Volatile Organic Compound (VOC) content of all paint materials.
   2. Samples:
      a. Manufacturer's color selector for custom mixed colors for Architect's color scheduling.
      b. Opaque coatings: Two 9 x 12 inch finished samples on hardboard of each color scheduled in each finish for review and approval. Identify boards with finish type, color mix number and scheduled substrate surfaces or materials.
      c. Transparent finishes and stains: Two 9 x 12 inch finished samples on same species of solid wood and plywood to be furnished under Section 062000 - Finish Carpentry, of each color scheduled in each finish for review and approval. Identify boards with finish type, color mix number and scheduled substrate surfaces or materials.

B. Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS:
1. Color chips: After final approval of all colors and tints by the Architect, submit to the Owner, color chips of all coatings used, with manufacturer's name and mix designation of the coating for the purpose of future re-ordering of coatings. Color chips shall be at least six (6) square inches in size, for each color and tint.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three documented years experience.

B. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

C. Environmental Requirements for Volatile Chemicals:

1. For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:
   a. Flat Paints and Coatings: VOC not more than 50 g/L.
   b. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
   c. Anti-Corrosive Coatings: VOC not more than 250 g/L.
   d. Clear wood finishes:
      1) Varnishes: VOC not more than 350 g/L.
      2) Lacquer: VOC not more than 550 g/L
   e. Floor coatings: VOC not more than 100 g/L
   f. Sealers:
      1) Waterproofing sealers: VOC not more than 250 g/L
      2) Sanding sealers: VOC not more than 275 g/L
      3) All other sealers: VOC not more than 200 g/L
   g. Stains: VOC not more than 250 g/L.

2. Do not use water based paints formulated with aromatic hydrocarbons (organic solvent with a benzene ring in its molecular structure), formaldehyde, halogenated solvents, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI and their oxides. Water based paints shall be low VOC and shall have a flash point of 61 degrees C or greater.

3. Where it is necessary to use solvent-based paints, with less than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

4. The following shall be low VOC and not be formulated with aromatic hydrocarbons (organic solvent with a benzene ring in its molecular structure).
   a. High performance water based acrylic coatings.
   b. Pigmented acrylic sealers.
   c. Catalyzed epoxy coatings.
   d. High performance silicone grafted epoxy coatings.

5. Restricted Components: Paints and coatings used on this Project shall not contain any of the following compounds. (Excluded from this restriction are residual quantities of naturally occurring elements and chlorinated organics which are found in chlorinated water supplies; contaminate levels shall be below that of the National Primary Drinking Water Standard):
   a. 1,2-dichlorobenzene
   b. Alkylphenol ethoxylates (APEs)
   c. Formaldehyde-donors
   d. Heavy metals, including lead, mercury, cadmium, hexavalent chromium and antimony in the elemental form or compounds
   e. Phthalates
   f. Triphenyl tins (TPT) and tributyl tins (TBT).
1.6 FIELD SAMPLES
   A. Provide field samples under provisions of Section 014000 - QUALITY REQUIREMENTS for purpose of verifying selected colors.
   B. Paint on-site sample areas, minimum 40 square feet, illustrating selected color, and tint.
   C. Locate samples where directed. The Contractor shall provide in the base Contract, a total amount of samples equal to one sample per room.
   D. Accepted samples may remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to site in sealed and labeled containers; container labeling shall include manufacturer's name, type of paint, color mix designation, expected coverage, surface preparation instructions, instructions for mixing and reducing, drying time, and clean-up recommendations.
   B. Store materials, conforming with applicable codes and fire regulations, in designated spaces. Keep storage area secure when direct access is not required or when not performing work under this Section. Take precautionary measures to prevent fire hazards and spontaneous combustion, maintain a dry-chemical type fire extinguisher in all areas where materials of this Section are being stored or used.
   C. Store paint materials in a well ventilated area at minimum ambient temperature of 45 degrees Fahrenheit and a maximum of 90 degrees Fahrenheit.
   D. Do not use the sanitary system for mixing or disposal of refuse material. Carry water to mixing rooms and dump waste material in a suitable refuse receptacle. Remove oily rags and waste each day.

1.8 PROJECT CONDITIONS
   A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
   B. Apply paints and finishes above minimum temperature conditions in strict accordance with manufacturer's instructions.
   C. Provide sufficient lighting to maintain 80 foot-candles measured mid-height at substrate surface.

1.9 SEQUENCING AND SCHEDULING
   A. The applicator of work specified herein is responsible to ensure that all paints, enamels, and coatings, proposed to be applied hereunder, are compatible with coatings used for shop-primed items and items which have been prime-coated under the work of other trades.
   B. Immediately notify the Architect in writing of conditions which may require a change in the specifications of this Section before proceeding with the work. Failure to do so, in a timely fashion, so as not to interfere with the schedule of work of this Contract, shall be construed as acceptance of the coatings specified. Perform all corrective measures, at no cost to the Owner, for any defects in the work, resulting from the use of such materials.
   C. Painting work should be scheduled so as to minimize touch-ups. Interior painting is to be without flashmarks. Should flashmarks occur due to touch-ups, the Contractor shall be required to redo the entire surrounding wall surface.
   D. Do not order materials until all required schedules have been properly submitted, reviewed by the Contractor and Approved by Architect.
PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      1. Paints and general finishes:
         b. Sherwin Williams, Cleveland, OH.
         c. Akzo Nobel Paints, LLC, Devoe High Performance Coatings, Strongsville, OH.
      2. Interior stains and clear finishes for wood
         a. Samuel Cabot, Inc., Boston MA.
         b. PPG Architectural Finishes Inc., Olympic Home Care Products Division, Pittsburgh, PA.

2.2 PAINTS AND COATINGS - GENERAL
   A. Paints and Coatings: Ready mixed, except for field catalyzed coatings with good flow and brushing properties; capable of drying or curing free of streaks or sags. Color pigments shall be processed to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating. Provide best quality grade, where manufacturer makes more than one grade of any material specified.

2.3 ACCESSORIES
   A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
   B. Cleaning Materials: Tri-Sodium Phosphate (TSP) substitute. Acceptable products include the following, or approved equal:
      1. Savogran, Norwood MA, products “TSP-PF”, or “Liquid TSP Substitute”.
      2. Custom Building Products, Seal Beach, CA., product “Custom T.S.P. Substitute”.
      3. DAP Inc., Baltimore MD., product “T.S.P. Substitute Heavy Duty Cleaner”.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Notify Contractor of any condition that may potentially affect proper application of coatings.
   B. Measure moisture content of surfaces, do not apply finishes unless moisture content of surfaces are below the following maximums:
      3. Masonry or concrete: 12 percent.
      4. Interior wood: 15 percent.
   C. Beginning Work of this Section means acceptance of existing substrate surfaces and site conditions.

3.2 PREPARATION
   A. Furnish and lay suitable drop cloths in all areas where coating work is being done to protect floors and all other surfaces from damage during the work. Protect adjoining surfaces with painters mask tape.
B. Prior to preparing surfaces or finishing, remove all finish hardware for painting doors and frames, except hinges and locks on exterior door; remove electrical plates, light fixture trim and fittings. Re-install hardware and other removed items after painted surfaces are thoroughly dry.

C. Mix coatings thoroughly, unless otherwise directed by the manufacturer of the specific coating used, to ensure uniformity of color and mass. Strain previously opened coatings to remove skins, lumps, and other foreign matter prior to painting.

D. Thin or reduce materials only as recommended by the specific material manufacturer, and only with the approval of the Architect.

E. Impervious surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to thoroughly dry.

F. Previously painted surfaces to receive wall covering:
   1. Sand with 320 grit waterproof paper until surfaces are uniformly abraded.

G. New interior wood items scheduled to receive paint finish.
   1. Smooth minor defects and remove all foreign matter by sanding, and if necessary, steel wool.
   2. Wash sap spots and knots with mineral spirits. When dry, touch up knots, pitch streaks, and sappy sections with commercial stain sealer.
   3. Fill up nail holes and cracks with wood putty or plastic wood after primer of first coat of finish is dry, and sand smooth.

H. Existing interior wood items scheduled to receive paint finish.
   1. Smooth minor defects by sanding. Remove all foreign matter with mineral spirits and fine sandpaper or steel wool.
   2. Touch up knots and pitch streaks with commercial stain sealer.
   3. Fill up nail wood defects, chips in layers of paint, and cracks with spackle. Ease edges of existing paint by application of spackle and sanding smooth.

I. Gypsum board surfaces, new and existing: Fill minor defects with latex based spackle. Spot-seal all compound surfaces and repair areas in gypsum board, with specified first coat material before application of the first coat.

3.3 APPLICATION

A. Apply all materials in strict accordance with the approved manufacturer's printed instruction, and in accordance with the best trade practices. Each coat shall be reviewed and approved by the Architect before succeeding coats are applied.

B. Do not apply successive coating until the preceding coat is thoroughly dry, and in no case in less than 24 hours after the preceding coat.

C. Number of coats is indicated under Painting Schedules. Number of coats is indicated as a minimum number to be applied over scheduled substrates. An additional coat or coats may be required for proper color coverage of substrate as determined by the Architect, at no additional cost to the Owner. Examples of these conditions include, but are not limited to:
   1. Dark colored substrates may require an additional primer or intermediate coat to stabilize color, if final applied top-coat color is light.
   2. Pre-finished or pre-primed products may require an additional field applied coat to stabilize the shop/factory applied base color prior to application of top-coat finishes.
   3. Dark color top coat finishes may require additional finish coat over white or light colored substrates to obtain correct color density.

D. Apply each coat to a uniform finish; Apply primer and first coat of slightly lighter in color tint than the scheduled color of the final coat.

E. Sand lightly between coats to achieve required finish and remove sanding dust prior to applying succeeding coat.
F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Prime back surfaces of all interior and exterior woodwork scheduled for painted finish with primer.

H. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

3.4 CLEANING

A. Upon completion of the work in each area, remove all coating splatters from glass, prefinished surfaces, bright metals, and from other surfaces that have not been painted or finished hereunder. Do not use abrasive paper or abrasive cleaner on any prefinished surface or bright metal. Remove all materials and debris; leave work area in a clean condition.

3.5 PROTECTION AND TOUCH-UP

A. During painting work, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Properly clean, repair or replace any work so damaged and soiled.

B. Protect all painted and finished surfaces against damage until the date of final acceptance of the work. The Architect will conduct a final review of all work performed hereunder. Re-coat or touch-up, all scratches and other blemishes on surfaces, and as directed by the Architect, any areas found which do not comply with the requirements of this Section, and bear all costs therefore.

C. Any re-coating or touch-up work, required after the work of this Section has been reviewed and accepted by the Architect, will be paid for by the Contractor.

3.6 PAINTING SCHEDULE

A. Colors: The Architect will furnish a schedule of colors for each area and surface. Tinting and matching shall be to the satisfaction of the Architect. No limit is placed on the number of colors that may be required, or the number of colors in any one room, area, or surface. Premium paints of deep-hued, bright, pigment intensive, accent and primary colors may be scheduled for up to 25 percent of all interior and exterior surfaces without additional cost to the Owner.

1. Colors of priming coats (and body coats where specified) shall be lighter in tint than those of finish coat.

2. Colorants: Pure, non-fading pigments, mildew-proof, ultra-violet resistant, finely ground in approved medium; and be limeproof, when used in coatings to be applied on masonry, concrete, plaster, and gypsum board surfaces.

B. Paint schedule for interior surfaces and materials: Refer to Section 099123 - INTERIOR PAINTING SCHEDULE.

END OF SECTION
SECTION 099123
INTERIOR PAINTING SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Surface preparation.
B. Field application of paints, stains, and varnishes.
   1. Number of coats scheduled herein below is minimum required, refer to Article entitled
      “APPLICATION” in specification Section 099100 - PAINTING, regarding coverage.

PART 2 - PRODUCTS

2.1 PAINTING SCHEDULE FOR INTERIOR SURFACES AND MATERIALS

A. Interior underside of metal decking, exposed to view joists, overhead steel, sprinkler piping,
   conduits, ducts and similar items:
   1. Two coats self-crosslinking hydrophobic acrylic:

B. Interior gypsum board (drywall) partitions and walls, previously painted:
   1. Two coats eggshell paint:

C. Interior gypsum board (drywall) partitions:
   1. One coat latex primer:
   2. Two coats eggshell paint:

D. Interior gypsum board (drywall) partitions, and ceilings, at toilet rooms, janitor’s closets, Soiled
   Rooms, Housekeeping Rooms, food preparation and dishwashing areas for VOC compliant
   epoxy finish:
   1. One coat of sealer:
      b. Tnemec: PVA 51-792 Sealer.
   2. Two coats of semi-gloss Water Based Acrylic-Epoxy Coatings (3 mils DFT each coat):

E. Interior gypsum board (drywall) ceilings and underside of soffits, previously painted:
   1. Two coats flat paint:

F. Interior gypsum board (drywall) ceilings and underside of soffits:
   1. One coat latex primer:
   2. Two coats flat paint:

G. Interior metal, ferrous, excluding railings, to receive semi-gloss finish: (includes existing metal
   doors and frames):
   1. One coat of rust prohibitive primer for unfinished metal surfaces, and touch up bare metal
      at shop primed, existing and previously coated surfaces:
   2. Two coats acrylic semi-gloss enamel:

H. Interior metal, (electrical panels, fire extinguisher cabinets and similar metal items):
   1. One coat of rust prohibitive primer for unfinished metal surfaces, and touch up bare metal
      at shop primed, existing and previously coated surfaces:

2. Two coats of gloss finish epoxy coating (dry film coat 1.5 to 2.0 mils).

I. Interior wood trim and other miscellaneous items, new, unfinished, to receive painted (opaque) finish:
   1. One coat acrylic primer-sealer (undercoater):
   2. Two coats acrylic semi-gloss enamel:

J. Cabinet unit heater and convection wall heaters, existing:
   1. Two coats acrylic semi-gloss enamel (spray apply only):
      a. Benjamin Moore & Company: Equivalent to products herein below.

K. Interior wood trim and refinishing of existing doors, to receive transparent-stain polyurethane (water-based) finish.
   1. One coat paste wood filler for open-grained woods.
   2. One coat acrylic stain: As recommended or acceptable to water-based polyurethane finish manufacturer, in tint to achieve finish matching Architect’s Sample.
   3. Transparent finish for existing doors as indicated: Match stain and finish of existing doors.
      Submit to Architect for approval, a finished sample on species of wood used for doors.
      Obtain written approval of finish system from Architect prior to application of finishes to doors.

L. Wood door tops and bottoms, cut in the field, (includes all wood doors, with or without a factory applied finish):
   1. Two coats of high-gloss finish clear water-based polyurethane:

2.2 PAINTING SCHEDULE FOR FIRE RESISTIVE AND RATED DESIGNATIONS

A. In compliance with Section 703.6 of the 2009 International Building Code, and as additionally specified herein, provide identification for all fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions and any other wall or partition which is required to have protected openings or penetrations.

1. Location:
   a. Apply to outside of fire rated shafts, and to both sides of partitions at intervals not to exceed 30'-0” for entire length of partition or wall, or once on any partition 30'-0 feet or less in length.
   b. Apply to fire rated plywood in I.T. Rooms, Electrical Rooms and similar spaces.
      1) Where FR Plywood is used as a finished wall surface, left visible, and painted, a laminated label shall be fabricated from the product literature submittal, identifying the fire rated material and securely fastened to the plywood.
   c. Locate identification in all accessible concealed floor, floor-ceiling and attic spaces.
      Locate identification within 12 to 18 inches above finished ceilings.

2. Application:
   a. Apply stenciled lettering by spray or brush, or provide permanent signage.
      Identification shall be waterproof, fade-proof and non-combustible. Signage shall be mechanically fastened or permanently adhered to partition.
   b. Stencil character height: 1 inch minimum.
   c. Color: Easily identifiable color, contrasting with background, acceptable to Owner.
3. Apply stenciled lettering to the following types of partitions using wording specified:
   a. Applied identification for 2 hour fire rated partitions shall read: “2 HOUR FIRE WALL - PROTECT ALL OPENINGS”.
   b. Applied identification for 1 hour fire rated partitions shall read: “1 HOUR FIRE WALL - PROTECT ALL OPENINGS”.
   c. Applied identification for Smoke barriers shall read: “1 HOUR SMOKE BARRIER - PROTECT ALL OPENINGS”.
   d. Applied identification for Smoke partitions shall read: “SMOKE BARRIER PARTITION - PROTECT ALL OPENINGS”.

2.3 PAINTING SCHEDULE FOR MECHANICAL AND ELECTRICAL EQUIPMENT
   A. Paint interior surfaces of air ducts, and convactor and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black enamel.
   B. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
   C. Remove unfinished louvers, grilles, covers and access panels and paint as scheduled above. Replace after painting is complete and paint is dry.
   D. Plywood backboards for electrical panels and other equipment. Paint both front and back surfaces and all edges of plywood backboards before backboards are installed.
      1. One coat latex primer-sealer (undercoater):
      2. Two coats fire retardant paint:
         a. Benjamin Moore & Company: Equivalent to products herein below.
         b. Fire Retardants Inc., Chaska MN., Product “Burn Barrier 20-20”.
         c. Firefree Coatings, Inc., San Rafael CA., product “Firefree22”.
         d. Flamstop, Inc., Fort Worth TX., product “Flamestop III paint additive” (mixed with latex paint, refer to wood trim paints specified herein).
         e. Rosco Inc., Sun River CA. Product “Flamex paint additive” (mixed with latex paint, refer to wood trim paints specified herein).
         f. The Sherwin-Williams Company: Flame Control 20-20 A.

PART 3 - EXECUTION (NOT USED)

END OF SECTION
VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Markerboards
B. Tackboards

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
D. Section 061000 - ROUGH CARPENTRY: Wood blocking, and nailers.
E. Section 092900 - GYPSUM BOARD: Gypsum drywall substrate.

1.3 REFERENCE STANDARDS

A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 014200 - REFERENCES.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide list of items proposed to be provided under this Section. Include manufacturer’s specifications, installation instructions, and other data needed to demonstrate compliance with specified requirements.
C. Shop Drawings: Provide Shop Drawings in sufficient detail to show fabrication, layout, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
D. Samples: Fabric, 300 by 300 mm (six by six inches).

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in an undamaged condition in manufacturer’s original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
B. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
C. Comply with product manufacturer’s written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

1.6 SITE CONDITIONS

A. Temperature: Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, and during installation of architectural woodwork; maintain temperature after installation until Owner’s Final Acceptance.
B. Relative Humidity: Maintain a relative humidity between 25 and 55 percent for a minimum period of 5 calendar days before, and during, installation of architectural woodwork: maintain relative humidity after installation until Owner’s Final Acceptance.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS

A. Markerboards: Magnetic glassboard consisting of 1/4 inch tempered safety glass with clear finish and eased corners for safety.
      a. Glass Color: As selected by Architect unless otherwise indicated on the Drawings.
      b. Size: As shown on the Drawings, available up to 72 by 144 inches.
      c. Frame: "Surround Timber" wood frame in color as selected by Architect.
      d. Mounting style: As selected by Architect.
      e. Accessories: Provide "box tray" in color selected by Architect.
         1) Size: 1.75 in. tall by 2.25 inches deep by 12 inches wide.

2.3 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

2.4 ACCESSORIES

A. Temporary Protective Cover: Sheet polyethylene, 8 mil (0.2 mm) thick.
B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of markerboard, molded ends, concealed fasteners, same finish as frame.
C. Mounting Brackets: Concealed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Beginning of installation means acceptance of existing substrate.
B. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation. Use concealed fasteners.
C. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (bond testing, etc.). Inspect surfaces and related construction to receive units. Partitions shall have reinforcing to receive fasteners. Verify type and placement of reinforcement.
D. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.
E. Verify that internal wall blocking or reinforcing plate blocking is ready to receive work of this Section.
F. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.
   1. Substrate shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.
G. Do not proceed with the installation until reinforcement is in place and surfaces are flat.

3.2 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.
B. Install with top of marker tray at 30 inches (760 mm) above finished floor.
C. Secure units level and plumb.
3.3 CLEANING
   A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
      1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by manufacturer.
      2. Dust or wipe with a damp cloth.
   B. Clean board surfaces in accordance with manufacturer's instructions.
   C. Cover with protective cover, taped to frame.
   D. Remove temporary protective cover at Date of Substantial Completion.

3.4 PROTECTION
   A. Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

END OF SECTION
SECTION 101124
TACKABLE WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Site-fabricated, fabric-covered tackable wall system.
   B. Accessories as required for complete installation.

1.2 RELATED REQUIREMENTS
   A. Drawings and general provisions of the Contract and
   B. Division 01 Specification Sections apply to this Section.
   C. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives,
      cleaning/maintenance materials, paints, coatings, and sealants.
   D. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and
      administrative requirements for construction and demolition recycling.
   E. Section 061000 - ROUGH CARPENTRY: Wood blocking, and nailers.
   F. Section 092900 - GYPSUM BOARD: Gypsum drywall substrate.

1.3 REFERENCE STANDARDS
   A. Comply with applicable requirements of the following standards and those others referenced in
      this Section, under the provisions of Section 014200 - REFERENCES.
      1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building
         Materials; 2016.
      2. ASTM C 209 - Test Methods for Cellulosic Fiber Insulating Board.
      4. ASTM D 1037 - Test Methods of Evaluating Properties of Wood-Base Fiber and Particle
         Panel Materials.
      5. UL listed, File R16381.

1.4 SUBMITTALS
   A. See Section 013000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide list of items proposed to be provided under this Section. Include
      manufacturer’s specifications, installation instructions, and other data needed to demonstrate
      compliance with specified requirements.
   C. Shop Drawings: Provide Shop Drawings in sufficient detail to show fabrication, layout,
      installation, anchorage, and interface of the work of this Section with the work of adjacent
      trades.
   D. Samples: Fabric, 300 by 300 mm (six by six inches).

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to Project site in an undamaged condition in manufacturer’s original sealed
      container or other packaging system, complete with labels and instructions for handling,
      storing, unpacking, protecting, and installing.
   B. Store products that are subject to damage by the elements, under cover in a weathertight
      enclosure above ground, with ventilation adequate to prevent condensation.
   C. Comply with product manufacturer’s written instructions for temperature, humidity, ventilation,
      and weather-protection requirements for storage.
1.6 SITE CONDITIONS
A. Temperature: Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, and during installation of architectural woodwork; maintain temperature after installation until Owner’s Final Acceptance.
B. Relative Humidity: Maintain a relative humidity between 25 and 55 percent for a minimum period of 5 calendar days before, and during, installation of architectural woodwork: maintain relative humidity after installation until Owner’s Final Acceptance.

PART 2 - PRODUCTS
2.1 TACKABLE WALL PANELS
A. Site-installed stretched fabric over tackable core and continuous perimeter and intermediate mounting extrusions applied directly to wall surface.
   1. Tackable Substrate:
      a. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Homasote, West Trenton, NJ, http://www.homasote.com.
      b. Molded, 98% recycled post-consumer paper, cellulose fiber structural panel with kerfing on the underside, consisting of the following physical characteristics:
         1) Thickness: 1/2 inch (13 mm).
         2) Density: 26-28pcf (416-448 kg/cu. m) tested in accordance with ASTM C 209.
         3) Tensile Strength: When tested in accordance with ASTM C 209:
            a) Parallel: 450-700 psi (3,100-4,830 kPa).
            b) Transverse: 750-1000 psi (5.1171-6.894 kPa).
         4) Hardness (Janka Ball): 230 lbs (104 kg) tested in accordance with ASTM D 1037.
         5) Water Absorption by Volume: When tested in accordance with ASTM C 209:
            a) 2 hour immersion: 7 percent maximum.
         6) Expansion: 50 to 90 percent relative humidity, 0.25 percent in accordance with ASTM C 209.
         7) Thermal Resistance: When tested in accordance with ASTM C 209 per ASTM C 518:
            a) R-value: 1.2 for 1/2 inch (13 mm) thick board.
            b) K-value: .512 Btu-in/ (h ft² °F).
            c) Noise reduction coefficient (NRC): 0.20

B. Fabric (TKBD-1A):
   1. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Carnegie Xorel, product "Fractal Emboss" in color selected by Architect, unless otherwise noted on the Drawings.
   2. Criteria:
      a. Width: 54 inches (137 cm).
      b. Repeat: 5.75 inches (15 cm) Length by 4.25 inches (11 cm) Width.
      c. Weight: 12 oz/linear yard.
      d. Backing: X-Protect™ Sit.
      e. Flame Retardancy: NFPA 260 Class 1.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Beginning of installation means acceptance of existing substrate.
B. Compliance: Comply with manufacturer’s product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation. Use concealed fasteners.
C. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (bond testing, etc.). Inspect surfaces and related construction to receive units. Partitions shall have reinforcing to receive fasteners. Verify type and placement of reinforcement.

D. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.

E. Verify that internal wall blocking or reinforcing plate blocking is ready to receive work of this Section.

F. Verify that wall surfaces are true and plumb and are prepared and ready to receive boards.
   1. Substrate shall be sound, smooth, flat, permanently dry, clean, and free of all foreign materials including, but not limited to, dust, paint, grease, oils, solvents, curing and hardening compounds, sealers, asphalt and old adhesive residue.

G. Do not proceed with the installation until reinforcement is in place and surfaces are flat.

3.2 PREPARATION

A. Follow manufacturer’s instructions by separating and allowing panels to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install only clean dry panels. Do not install wet panels.

C. Floor Panel Installation: Space panel joints 3/16 inch (5 mm) apart; 3/8 inch (10 mm) space at walls and partitions. Stagger joints. See manufacturer’s installation procedures for specific finish floor systems.

D. Gluing pattern:

   A. Concrete floor must be clean, dry and free of moisture issues such as sweating. A vapor barrier must be used with new concrete subfloors. Areas such as basements and other below grade installations must be moisture free. Any moisture sources and or problems must be addressed prior to the installation of the product.

3.4 CLEANING

A. Clean exposed surfaces of tackable wall system, complying with manufacturer's instructions for cleaning and repair of minor finish damage. Remove and replace work that cannot be
successfully cleaned and repaired to permanently eliminate evidence of damage prior to Substantial Completion.

3.5 PROTECTION

A. Protect installed product and finish surfaces from damage until completion of project.

END OF SECTION
SECTION 102113
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Furnish and install:
   1. High pressure laminate (HPL) toilet partitions.
   2. High pressure laminate (HPL) Urinal privacy screens.

1.2 RELATED SECTIONS
A. Section 055000 - Metal Fabrications.
B. Section 061000 - Rough Carpentry.
C. Section 102813 - Toilet Accessories.

1.3 SUBMITTALS
A. Submit under provisions of Section 013000 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
   1. Plans, elevations, details of construction and attachment to adjacent construction.
   2. Show anchorage locations and accessory items.
   3. Verify dimensions with field measurements prior to final production of toilet compartments.
D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE
A. Manufacturer Qualifications: Minimum 10 year experience manufacturing similar products.
B. Installer Qualifications: Minimum 2 year experience installing similar products.
C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.
E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
B. Handling: Handle materials to avoid damage.
1.6  PROJECT CONDITIONS
   A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7  SEQUENCING
   A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8  WARRANTY
   A. Manufacturer's Warranty: Manufacturer's standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.
   B. Manufacturer's Warranty (DesignerSeries and MetroSeries): Manufacturer's standard 2 year warranty for materials and workmanship.
   C. Manufacturer's Warranty (TrimLineSeries and AccentSeries): Manufacturer's standard 5 year warranty for materials and workmanship.

PART 2 - PRODUCTS

2.1  MANUFACTURERS
   A. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. www.bobrick.com. Location of manufacturing shall be the United States.
   B. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Section 016200 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.

2.2  TOILET PARTITIONS
   A. High Pressure Laminate Toilet Partitions:
      1. Design Type, as selected by the Architect from the following:
         a. Standard Height.
            1) Door/Panel Height: 58 inches (147 cm).
            2) Floor Clearance: 12 inches (30 cm).
         b. Maximum Height.
            1) Door/Panel Height: 72 inches (183 cm).
            2) Floor Clearance: 4-5/16 inches (11 cm).
      2. Mounting Configuration:
         a. Floor-mounted, overhead-braced with satin finish, extruded anodized aluminum headrails, 0.065 inch (1.65 mm) thick with anti-grip profile.
            1) Stile Height: 83 inches (211 cm).
   B. High Pressure Laminate Urinal Screens:
      1. Mounting Configuration:
         a. Wall-hung.
            1) Screen Height: 42 inches (107 cm) with 18 inches (46 cm) floor clearance.
            2) Screen Height: 48 inches (122 cm) with 12 inches (30 cm) floor clearance.
      2. Finished Thickness: 1 inch (25 mm) for stiles, doors, screens and panels.
      3. Materials: 3-ply, stiles, panels, doors, and screens.
         a. Cores: 45 lb (20.4 kg) density, industrial grade, resin-impregnated, particle board.
b. Surfaces: High-pressure laminated plastic NEMA LDS-1985 minimum thickness 0.050 inch (1.33 mm) with matte finish.

c. Fabrication: Bonded high-pressure plastic laminate to core material with adhesive specially formulated to prevent delamination. Edges bonded prior to bonding face sheets. Splices or joints in faces or edges are not acceptable except in the case of laminate material limitations.

d. Color: As selected by Architect from manufacturer's standard range.

4. Fire Resistance:
      1) Flame Spread Index (ASTM E 84): 60 for panels and stiles.
      2) Smoke Developed Index (ASTM E 84): 265 for panels and stiles.

5. Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.

6. Leveling Devices: 3/8 inch x 7/8 inch (10 mm x 22 mm) steel bar welded to 11 gauge (3 mm) steel-reinforcing core; chromate-treated and double zinc-plated; welded to sheet-steel core of stiles.

7. Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304 stainless steel, 4 inch (102 mm) height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch (19 mm) or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

8. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).

9. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 05 50 00 - Metal Fabrications.

10. Hardware:
   a. Compliance: Operating force of less than 5 lb (2.25 kg).
   b. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment on inswing doors.
   c. Materials: Stainless Steel 18-8, Type 304, heavy-gauge stainless steel with satin finish.
   d. Fastening: Hardware secured to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded inserts.
   e. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
   f. Locking: Door locked from inside by sliding door latch into keeper.
   g. Hinge Type: Balanced, with field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied
   h. Mounting Brackets:
      1) Standard Concealed: Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.

PART 3 - PRODUCTS

3.1 PREPARATION

A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.

1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.

2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

3.2 INSTALLATION

A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
   1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
   2. Verify location does not interfere with door swings or use of fixtures.
   3. Use fasteners and anchors suitable for substrate and project conditions
   4. Install units rigid, straight, plumb, and level.
   5. Conceal evidence of drilling, cutting, and fitting to room finish.
   6. Test for proper operation.

3.3 ADJUSTING, CLEANING AND PROTECTION

A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.

B. Touch-up, repair or replace damaged products.

C. Clean exposed surfaces of compartments, hardware, and fittings.

END OF SECTION
SECTION 102600
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Bumper Rails.
B. Corner guards.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
B. Section 016000 - Product Requirements: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
C. Section 017419 - Construction Waste Management and Disposal: Procedural and administrative requirements for construction and demolition recycling.
D. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.
E. Section 097200 - Wall Coverings: Terminating wall covering at corner guard.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: For each type of product.
C. Shop Drawings: For each type of wall and door protection showing locations and extent.
   1. Include plans, elevations, sections, and attachment details. Show handrail design and support spacing required to withstand structural loads.
D. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long.
E. Product certificates.
F. Material certificates.
G. Sample warranty.
H. Maintenance data.

1.5 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Wall Protection and Corner Guards:
2.2 COMPONENTS

A. Bumper Rails (BR-1):
      b. Finish: #4 Satin finish.
      c. Angle: 90 degrees.
      d. Refer to Drawings for locations.

B. Corner Guards (CG-1):
      b. Finish: #4 Satin finish.
      c. Wing size: 1 in. (25.4mm).
      d. 1/8” radius at corner.
      e. Angle: 90 degrees.
      f. Refer to Drawings for locations.

C. Corner Guards CG-2):
      b. Finish: #4 Satin finish.
      c. Wing size: 1 in. (51 mm).
      d. 1/8” radius at corner.
      e. Angle: 90 degrees.
      f. Refer to Drawings for locations.

2.3 FABRICATION

A. General: Fabricate wall protection systems to comply with requirements indicated for design, dimensions, detail, finish and member sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.2 INSTALLATION

A. Install components in accordance with manufacturer’s instructions, level and plumb, true to line and secured rigidly in position to wall without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Align with top of door.
   2. Cement-On installation only (no holes).
   3. Mounting Heights: Install wall protection in locations and at mounting heights indicated on Drawings.

B. Accessories: Provide Mastic Construction Adhesive such as PL® Premium Heavy Duty Adhesive, as recommended by Manufacturer.

END OF SECTION
SECTION 102813
TOILET ACCESSORIES

PART 1 - GENERAL
1.1 SECTION INCLUDES
   A. Furnish (as indicated) and install the following:
      1. Commercial toilet accessories.
      2. Under-lavatory pipe supply covers.

1.2 RELATED REQUIREMENTS
   A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply
      to this Section.
   B. Section 016000 - Product Requirements: Listing of VOC requirements for adhesives,
      cleaning/maintenance materials, paints, coatings, and sealants.
   C. Section 017419 - Construction Waste Management and Disposal: Procedural and
      administrative requirements for construction and demolition recycling.
   D. Section 061000 - Rough Carpentry: Wood blocking and concealed supports for wall mounted
      equipment and accessories, including in wall framing and plates and above ceiling framing.
   E. Section 092900 - Gypsum Board:
      1. Gypsum board partitions and metal framing as substrate assembly for various
         accessories.
   F. Section 093000 - TILING: Tiled walls as substrate for toilet accessories.
   G. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.3 REFERENCE STANDARDS
   C. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping;
      2015.
      2018.
      Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.4 COORDINATION
   A. Coordinate accessory locations with other work to prevent interference with clearances
      required for access by disabled persons, proper installation, adjustment, operation, cleaning,
      and servicing of accessories.
   B. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling
      supports, and reinforcement of toilet partitions to receive anchor attachments.
   C. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent
      delaying the Work.

1.5 SUBMITTALS
   A. See Section 013000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Submit data on accessories describing size, finish, details of function, and
      attachment methods.
   C. Samples: Submit two samples of each accessory, illustrating color and finish.
   D. Manufacturer’s Installation Instructions: Indicate special procedures and conditions requiring
      special attention.
PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Specified Manufacturer (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on the products and materials specified in the following Articles.

2.2 MATERIALS
   A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
   B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
   C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
   D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
   E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
   G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
   H. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

2.3 FABRICATION
   A. General: One, maximum 1-1/2-inch-(38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
   B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
   C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
   D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
      1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
   E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
      1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
      2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
   F. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Owner's representative.
2.4 FINISHES
   A. Stainless Steel: Satin finish, unless otherwise noted.

2.5 TOILET ACCESSORIES
   A. **Coat/robe hook (CH-1):** Surface mounted bright polished finish stainless steel double robe hook, fabricated from 22 gage type 304 stainless steel, protrudes from wall nominally 1-7/8 inches.
   B. **Coat/robe hook (CH-1):** Surface mounted bright polished finish stainless steel lab coat hook, fabricated from 22 gage type 304 stainless steel, (1" W x 6-1/2" H x 3-1/16" D).
   C. **Towel dispenser (PT-1),** recessed (capacity of 350 C-fold towels):
   D. **Towel dispenser & waste receptacle units, (PT-2):** Semi-recessed combination paper towel dispenser and waste receptacle unit with 2 inch deep skirt, stainless steel door and cabinet, welded construction. Paper towel dispenser shall have a capacity of 600 “C fold” or 800 “Multi-fold” towels. Waste container shall have a removable leak-proof rigid molded plastic container with a capacity of 12 gallons.
   E. **Grab bars, (GB-1 & 2):** 1-1/2 inch diameter with satin finished ends, concealed 1/8 inch thick mounting flange with snap-on cover, equal to:
   F. **Frameless Mirror, (MR-1):** 23 1/2" W x 35 1/2" H (60 x 90cm). Bright-polished stainless steel. Mirror has 1/4" (6mm) return concealing 1/4" (6mm) tempered masonite backing.
   G. **Toilet Seat Cover Dispenser, (SC-1):** Satin-finish stainless steel, dispensing 250 single or half-fold toilet seat covers or one box, filled from the bottom. Unit 15-3/4" W, 11" H, 2" D (400 x 280 x 50mm).
   H. **Soap dispensers, (SD-1):** Surface mounted for viscous free flowing soaps, with lockable 40 fluid ounce stainless steel container, and corrosion resistant all purpose valve for liquid soaps, lotions and detergents which will operate with less than 5 pounds of force.
   J. **Toilet tissue dispenser, (TT-1):** Surfaced mounted, toilet tissue dispensers: multi roll toilet tissue dispenser with automatic drop down feature, able to accommodate two standard core 1500 sheet rolls.

2.6 UNDER-LAVATORY PIPE AND SUPPLY COVERS
   A. Unless otherwise noted within Division 22, provide ADA piping projection under sinks within casework as follows:
      1. Piping protection under sinks within casework
            1) Material: Rigid high-impact, stain-resistant PVC.
            2) Nominal Wall: .093 inch constant.
            3) Finish: Fine haircell.
4) UV Protection: Will not fade or discolor.
5) Fasteners: Eight (8) - #6 X 1/2" screws.
6) Color: White or beige as selected by the Architect.
7) Paintability: Apply acrylic enamel or latex paint.
8) Flammability UL-94 V-0, 5VB.

2. Piping protection under wall-mounted sinks:
       1) Material: Rigid high-impact, stain-resistant PVC.
       2) Nominal Wall: 1/8" constant with internal ribs.
       3) Durometer: 70-80 - Shore A.
       4) UV Protection: Will not fade or discolor.
       5) Trimming (E-Z Series): E-Z Tear-To-Fit trim feature (no tools needed).
       6) Fasteners: Internal E-Z Grip fasteners, reusable.
       7) Color: China white.
       8) Paintability: Apply acrylic enamel or latex paint.
       9) Flammability UL-94 V-0, 5VB.
      10) Compatibility #100 Series: Fits all 1-1/4" or 1-1/2" cast brass or tubular P-trap assemblies and 3/8" or 1/2" angle stop assemblies.
      11) Compatibility #400* Series: Fits all 1-1/2" schedule 40 plastic P-traps.
      12) Paintability: Apply latex paint.
      13) Burning Characteristics ASTM D-635: Self extinguished 0 sec (ATB) mm (AEB).
      14) Bacteria/Fungus Resistance: ASTM G21 and G22 - Result: 0 growth.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Verify existing conditions before starting work. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
   B. Verify exact location of accessories for installation.

3.2 PREPARATION
   A. Provide templates and rough-in measurements as required. Deliver inserts and rough in frames to site at appropriate times for building in by other trades.
   B. Coordinate with trades responsible for providing receiving surfaces on which accessories will be installed.
   C. Exact locations of accessories within each room or area shall be as directed by the Architect.

3.3 INSTALLATION
   A. Perform installation work in accordance with the approved shop drawings and the manufacturer's installation instructions.
   B. Install toilet accessories absolutely level and in true line, securely and rigidly anchored with theft proof fasteners of the size and type most appropriate for the specific receiving surface, concealing the fasteners as far as practicable.
   C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 ADJUSTING
   A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly.
   B. Replace units which are damaged, defective and/or cannot be adjusted to operate freely and smoothly as intended for the application made.
3.5 CLEANING
   A. Remove all protective films and coverings from accessories, and clean and polish each piece.
      Remove all rubbish, packing materials, and debris, caused by the work of this Section.
   B. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.6 PROTECTION
   A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION
SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES
   A. Fire extinguishers.
   B. Fire extinguisher cabinets.
   C. Accessories.

1.2 RELATED REQUIREMENTS
   A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.
   B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
   C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
   D. Section 061000 - ROUGH CARPENTRY: Wood blocking product and execution requirements.
   E. Section 092900 - GYPSUM BOARD: Framing of openings for fire extinguisher cabinets.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS
   A. See Section 013000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
   B. Shop Drawings: Indicate cabinet physical dimensions.
   C. Product Data: Provide extinguisher operational features.
   D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
   E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
   B. Conform to NFPA 10.
   C. Provide extinguishers and cabinets classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION
   A. Deliver materials to project site in manufacturer's original, unopened undamaged containers, with identification labels intact.
   B. Store materials in original packaging, protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by the manufacturer.

1.7 FIELD CONDITIONS
   A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.
B. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

B. Fire Extinguisher Cabinets and Accessories:

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Carbon Dioxide Type Fire Extinguishers: Aluminum tank, with pressure gauge.
   1. Class: B:C type.
   2. Size: 5 pound (2.27 kg).
   3. Finish: Baked enamel, red color.
   4. Basis of Design: Larsen's Manufacturing Co; CD Series, Model 322NM.

C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
   1. Class: ABC type.
   2. Size: 5 pound (2.27 kg).
   3. Finish: Baked enamel, red color.

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Semi-recessed fire extinguisher cabinets:
   1. Cabinet trim style: Square trim, semi-recessed cabinet.
      a. Protruding from wall: nominally 1-1/4 to 1-1/2 inches.
   2. Door: Cold-rolled steel with factory applied white thermally fused polyester coating, acceptable to receive a field applied recoating.
      a. Style: Vertical duo design with clear tempered safety glass.
      b. Door Handle: Door handle matching material and finish of door.
      c. Lettering: Factory applied die-cut lettering, applied to metal portion of door.
         1) Pattern: Vertical reading.
         2) Color: Black
   3. Acceptable models for non-fire-resistant rated assemblies:
      a. JL Industries “Ambassador Series”, model number 1816.
      b. Larsen “Architectural Series”, model number 2409-5R.
   4. Acceptable models for fire-resistant rated assemblies:
      a. JL Industries “Ambassador Series”, model number 1816-FX.
      b. Larsen “Architectural Series”, model number FS-2409-5R.
2.4 ACCESSORIES
   A. Extinguisher Brackets: Formed steel, chrome-plated.
   B. Provide bracket for all fire extinguishers not located in cabinets.
   C. Cabinet Signage: 14 inches by 12 inches 90° angle projecting wall mounted sign with vertical arrows and lettering.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Verify existing conditions before starting work.
   B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install cabinets plumb and level in wall openings, at height indicated from finished floor.
   C. Secure rigidly in place.
   D. Place extinguishers in cabinets.
   E. Install brackets at locations where fire extinguishers are not indicated to be in cabinets.
      1. Secure rigidly in place.
      2. Mount extinguishers on brackets.

END OF SECTION
SECTION 105126
PLASTIC-LAMINATE-FACED LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install plastic laminate faced lockers, for installation on wood curb framing, complete with all required plastic laminated trim closures, filler pieces, and accessories.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply to this Section.

B. Section 016000 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.

C. Section 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

D. Section 061000 - ROUGH CARPENTRY: Wood framing and nailers.

1.3 SUBMITTALS

A. Submit the following under provisions of Section 013000 - ADMINISTRATIVE REQUIREMENTS:

1. Literature: Manufacturer’s product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.

2. Warranty: Provide sample copies of manufacturers’ actual warranties, clearly defining all terms, conditions, and time periods for the coverage thereof.

3. Shop drawings:
   a. 1/4 inch scale (minimum) plans of each area with specified lockers, include layout of all lockers, closures, and filler panels and large scale details of locker construction; and details of accessory items.
   b. Large scale details of locker and bench construction, showing filler trim, end and edge panels, attachment clips, brackets and complete installation details.

4. Verification samples: Two 12 x 12 inch samples of selected laminate with edging.

B. Certificates: Wood products lacking acceptable documentation for the following will be rejected and their removal required.

1. Composite Wood and Agrifiber Products: Written documentation certifying that all composite wood and agrifiber products used on this Project contain no added urea-formaldehyde resins.
   a. Written certification indicating that only “no added urea-formaldehyde” manufactured composite panel products are incorporated into the Work, including all concealed components. Composite panel products include but are not limited to particle board (PB), Medium Density Fiberboard (MDF), wheatboard and strawboard and similar manufactured products.
   b. Written certification indicating that laminating adhesives used in product fabrication on or off site do not contain any added urea-formaldehyde resins.

2. Manufacturer’s Instructions: Provide installation instructions and templates for hardware and field applied items.

3. Source Quality Control Submittals: AWI letter of licensing for the project for AWI Quality Certification Program.

C. Closeout Submittals: Submit the following under provisions of Section 017800 - CLOSEOUT SUBMITTALS.

1.4 DELIVERY, STORAGE AND HANDLING

A. Do not order or fabricate lockers, until all specified submittals have been submitted to, and approved by, the Architect.
B. Store lockers inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

C. The locker manufacturer, locker installer and the Contractor are all jointly responsible to make certain that casework is not delivered until the building and storage areas are sufficiently dry so that the casework will not be damaged by excessive changes in ambient humidity and relative moisture content.

D. Concrete, masonry, plaster, tile and marble setting and polishing and other wet work shall be completed and dry before delivery, storage and installation of casework items.

E. Ship and handle all materials and fabricated items in a manner which will prevent damage thereto, and store all materials and fabricated items at a dry, elevated, ventilated, and protected interior location.

F. Sequence deliveries to avoid delays and to minimize on-site storage.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, during, and after installation of casework; maintain temperature until Owner’s Final Acceptance.

B. Maintain a relative humidity between 25 and 55 percent for a minimum period of 5 calendar days before, during, and after installation of casework: maintain relative humidity until Owner’s Final Acceptance.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

1.7 WARRANTY

A. Furnish the following warranties under provisions of Section 017800 - CLOSEOUT SUBMITTALS:

1. Manufacturers standard material and workmanship warranty on the work of this Section for a period of 3 years following Date of Substantial Completion.
   a. Provide 1 year warranty for lock parts

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Ideal Products, Inc., Brea CA. Manufacturers offering similar products which may be considered as equal, are limited to the following:

1. Legacy Lockers, Inc. Dallas TX.
2. Treeforms Lockers, Greensboro NC.
3. Hollman Inc., Irving TX.

2.2 LOCKERS

A. Locker Description:

1. Ideal "1000 Series", Model "L42", 2-tier lockers.
   a. General Description: 48 lb. industrial grade particle board core frame with fire retardant plastic laminate doors with round corners and vinyl T-molding edging.
   b. Size: 12 (W) by 18 (D) by 72 inches (H).
   c. Ventilation through rear panel 32mm system
   d. Recessed Padlock Hasp
   e. Heavy Duty Exposed Knuckle Hinges
   f. Clothes Hooks and Number Discs as selected by Architect.
2. Units shall sit upon built-up surface consisting of 2 by 4 inch wood base and 1/2 inch plywood.

B. Materials:
   1. Locker Interior:
      a. Interior vertical surfaces of sides and back panel are finished with 6 mil frosty white vinyl.
      b. Interior horizontal surfaces of shelves, tops and bottoms are finished with black thermal-fused melamine.
      c. Locker frame constructed of 48 lb. industrial grade particleboard core ANSI A208.1, grade 1-M-2, 45 (Sides= 5/8” Shelves=3/4”, Back= 1/4”).
      d. Frame edged for 1000 Series with 13/16” convex face, center barb, polyethylene vinyl t-molding with choice of colors: black, grey, white, sand & brown (VT).
      e. Locker venting through rear panel 32m system.
   2. Doors, End Panels, Sloped Tops
      a. Plastic laminate. high pressure. class II-B fire retardant, VGS-GP28, "14" STD PB, UL & HPMA.
      b. Radius corners for 1000 Series edges finished with 13/16” convex face polyethylene Vinyl T-molding (VT).
   3. 3/4" thickness 48 lb. industrial grade particle board with choice of vertical grade fire retardant (class II-B) plastic laminate for exterior finish and interior Wilsonart 1573 vertical grade frosty white cabinet liner.

2.3 HARDWARE
   A. Hinges, heavy duty:
      1. 1000 Series -- black 180 degree opening 2-3/4” exposed five knuckle (EH).
   B. Locks, heavy duty, specify:
      1. Padlock hasps either recessed (RP) or surface (SP), as selected by Architect, mounted through-bolted, case harden and cadmium plated steel.
      2. Keyed Locks (KL), heavy duty cam operated, chrome, brass or black finish, as selected by Architect. 2 keys per lock and master keyed, and select KD100, KD400, DK1000.
      3. Dial Combination with changeable codes and master keyed bypass (DC).
      4. Pushbutton Combination lock sets with over 2000 different combinations either satin chrome or brass finish (PC).
      5. Coin Collect (CC). Coin Return (CR), Token (TO) and Card Operated (CO).
   C. Cloths Hooks, aluminum or brass finished, as selected by Architect.
      1. Side mounted double or single prong.
      2. Ceiling mounted double prong.
   D. Coat Rods, nickel plated.
   E. Number Discs: 1¾” diameter, ¼” numerals recessed flush in door, satin chrome, satin brass or black as selected by Architect.

2.4 FABRICATION
   A. Fabricate lockers in single width units with no common walls; fabricate square and rigid, without warp. Construction shall be doweled and glued, throughout.
   B. Factory machine attachment holes accurate and free of chips.
   C. Fabricate corners, fillers, scribes, tops as required for installation.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that field measurements are as indicated on reviewed and approved shop drawings.
B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Do not commence installation of lockers until immediately adjacent surfaces have been completely installed and finished.

B. Perform installation work in accordance with the approved shop drawings and the manufacturer's installation instructions.

C. Set lockers absolutely level and in true line, with units bolted together and to the surrounding partitions, to provide a rigid and secure installation.
   1. Anchor locker units to wall studs through the locker back and to the base through the locker floor. Join side by side lockers by attaching fasteners through pre-drilled holes.
   2. Conceal screw heads and bolts as far as practicable, leaving locker cabinets completely free from unused bolt holes.

D. Furnish and install all trim and filler pieces as required to completely fill recesses, and to align with ends of partitions. Refer to the Drawings for the various conditions.

E. Adjust and align doors for uniform spacing after installation of lockers.

F. Attach number plates in sequence after lockers are in place.

3.3 ADJUSTING AND CLEANING

A. Test each door and latching device, and make adjustments required to ensure a bind-free operation and proper latching.

B. Remove all tape and other packing materials from locker surfaces, and thoroughly clean and polish all exterior and interior surfaces.

3.4 PROTECTION

A. Protect locker finish surfaces and hardware from damage until Owners Final Acceptance.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
   A. Provide residential appliances, including the following:
      1. Microwave oven.
      2. Refrigerator
      3. Refrigerator/freezer.

1.2 RELATED REQUIREMENTS
   A. Section 064000 - ARCHITECTURAL WOODWORK: Kitchen cabinets.
   B. Division 26 - ELECTRICAL: Electrical supply to appliances.

1.3 SUBMITTALS
   A. Submit the following:
      1. Literature: Manufacturer's product data sheets and specifications, for each product
         installed and furnished hereunder clearly indicating configurations, sizes, materials,
         finishes, locations, utility connections and locations. Include information on accessories
         and options.
      2. Manufacturer's installation instructions: Indicate special procedures, perimeter conditions
         and conditions requiring special attention.
      3. Manufacturer's certificates: Certify that Products provided under this Section meet or
         exceed UL and specified requirements.
      4. Manufacturer's sample warranties.
   B. Submit the following under provisions of Section 017800 - Closeout Submittals:
      1. Manufacturer's warranties: Include coverage of installed equipment.

1.4 REGULATORY REQUIREMENTS
   A. Products requiring electrical connections: Listed and classified by UL, as suitable for the
      purpose specified and indicated.
   B. Provide and install the work of this Section in conformance with all applicable federal, state and
      municipal codes, laws and regulations regarding utilities, health, fire protection and safety.

1.5 QUALITY ASSURANCE
   A. Certification labels: Provide residential equipment which complies with standards and bears
      certification labels as follows:
      1. Energy ratings: Provide energy guide labels with energy cost analysis (annual operating
         costs) and energy information as required by Federal Trade Commission.
      2. UL standards: Provide residential equipment with UL labels.

1.6 DELIVERY, STORAGE AND HANDLING
   A. Store all materials in original packaging in protected interior location.
   B. Coordinate schedule of construction, size of access and route to place of installation to prevent
      delay of installation due to physical impediments. Any work involving the demolition and
      reconstruction of partitions, walls, floors, roofing, windows or doors to place and install the work
      of this Section shall be performed at no additional cost to the Owner.

1.7 WARRANTY
   A. Provide manufacturer's standard warranties under the provisions of Section 01 78 00 -
      Closeout Submittals.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General: Provide products of same manufacturer for each type of residential appliance required. To greatest extent possible, provide equipment by single manufacturer for entire project.
   1. In kitchens, provide appliances with matching color and style. When equipment is by more than one manufacturer, provide units matching

B. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on companies listed under the Article “Equipment”.

2.2 EQUIPMENT

A. Microwave oven: Equal to Whirlpool - 2.2 cu. ft. Countertop Microwave with 1,200-Watt Cooking Power, Model #WMC50522HZ, consisting of the following:
   1. Capacity: 2-1/5.
   7. Blower Type: Forced Air.

B. Refrigerator: Equal to Whirlpool - 31-inch Wide “SideKicks” All-Refrigerator with LED Lighting, Model #WSR57R18DM, consisting of the following:
   1. Cabinet Width: 30-1/4 inches.
   5. Depth Closed Including Handles: 31-1/4 inches.
   9. Height to top of Cabinet: 66-1/4 inches.
   12. Width: 30-1/4 inches.

C. Refrigerator/freezer: Equal to Whirlpool - 30-inch Wide Top Freezer Refrigerator - 19 cu. ft., Model #WRT549SZDM, consisting of the following:
   2. Capacity: 19-23/100.
   3. Depth: 34-1/2 inches.
   5. Depth Closed Including Handles: 34-1/2 inches.
   7. Depth with Door Open 90 Degree: 59-7/8 inches.
   12. Refrigerator Volume: 14.08 cu. ft
PART 3 - EXECUTION

3.1 EXAMINATION
A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Notify the Contractor, and copy to Architect, in writing of any conditions detrimental to the proper and timely completion of the work, and do not proceed with the work until said conditions are corrected.
B. Verify clearances required for equipment.
C. Verify ventilation outlets, service connections, and supports are correct and in required location.
D. Verify that electric power is available and of the correct characteristics.
E. Beginning of installation means acceptance of existing site conditions.

3.2 INSTALLATION
A. Install each product in accordance with manufacturers' instructions.
   1. Maximum variation for installed equipment, from true position of 1/16 inch in 8 feet for plumb and level and a maximum of 1/32 inch offsets in adjoining surfaces intended to be flush.
B. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.
C. Anchor equipment using devices appropriate for equipment, substrate and expected usage.

3.3 ADJUSTING
A. Adjust equipment to ensure proper working order and conditions.
B. Remove and replace equipment creating excessive noise, or vibration.
C. After installation is completed, insure that operating parts work freely and fit neatly. Adjust hardware and catches as required. Repair or replace damaged parts dents, buckles, abrasions, scraps or other damage affecting the appearance or serviceability.

3.4 CLEANING
A. At completion of each work day, remove tools and all crating boxes, coverings, rubbish and debris from the work area; leave area in broom-clean condition.
B. Upon completion of the work of this Section, remove tools and all crating boxes, coverings, rubbish and debris from the work area; leave area in broom-clean condition.
C. Clean Work under provisions of Section 01 73 00 - Execution:
   1. Wash and clean appliances.
   2. Clean and polish glass, plastic, hardware and accessories, fixtures and fittings.
D. Remove protective coverings from prefinished work just prior to Owner's acceptance of facility.

END OF SECTION
SECTION 115313
LABORATORY FUME HOODS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes Laboratory Fume Hoods:
B. Related Sections include the following:
   1. Division 12 Section 3213 “Laboratory Casework” for base unit and work surface.
   2. Division 23 Sections for fume hood vent connections.
   3. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized gymnasium equipment.

1.2 DESIGN REQUIREMENTS

A. Design fume hoods as ventilated, enclosed workspaces, designed to capture, confine and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
B. 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.
C. Average illumination of work area: Minimum 80 footcandles. Work area is 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 57 inches.
D. Design fume hood to minimize static pressure loss with stainless steel round 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:
   1. Face Velocity at sash full open - Measured S.P.L. (W.G.)
      a. 80 F.P.M. .20 inches
      b. 100 F.P.M. .30 inches
      c. 120 F.P.M. .45 inches
E. Fume hood shall maintain essentially constant exhaust volume at any baffle position for safety. Maximum variation in exhaust CFM, static pressure and average face velocity as a result of baffle adjustment shall not exceed 5% for any baffle position at the specified face velocity.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data and installation instructions for each type of fume hood.
B. Shop Drawings: Submit shop drawings for fume hoods showing 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.
   1. Coordinate shop drawings with other work involved.
   2. Provide roughing-in drawings for mechanical and electrical services.
C. Samples for Selection: Submit color samples of manufacturer's finish.
D. Certificates: Provide test results to the owner detailing the latest ANSI/ASHRAE 110 performance for the following fume hood types:
   1. Bench Bypass Hood (split combo sash)
   2. Data is based on the following:
a. A five-minute test run at 80 FPM face velocity with the fume hood sash at the owner-defined operating position. Hood tests gas challenge rate are four (4) liters per minute.

b. A sash movement test per above-mentioned specification.

c. A 1" perimeter test per above-mentioned specification.

E. Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide laboratory fume hoods (for integration with laboratory furniture, tops, sinks, and service fixtures, as required) manufactured or furnished by laboratory furniture company for single responsibility.

B. Catalog Standards: Manufacturer's catalog numbers may be indicated on drawings for convenience in identifying certain fume hoods. Unless modified by notation on drawings or otherwise specified, manufacturer's current catalog description for indicated number, together with indicated or specified options or accessories, constitutes requirements for each such unit.

C. All laboratory fume hoods are designed to provide maximum safety for the user. All manufacturers desiring approval for this project must maintain a fume hood test facility at their factory location. This facility must provide for variable exhaust and make-up air control. In addition, any facility that provides for fume hood make-up air by using floor-to-ceiling wall diffusers is unacceptable. All qualified test facilities must contain, as part of their permanent equipment, ANSI/ASHRAE 110-1995 testing hardware as specified in that standard. In addition, all data readings shall be computer-recorded.

D. Source Quality Control: Architect reserves right to require manufacturer to demonstrate hood performance prior to shipment to prove compliance with contract requirements. Test hoods, testing facility, necessary instrumentation, apparatus and equipment will be supplied by manufacturer at no cost to Owner. Test hoods to verify performance requirements, using smoke and air flow meters and in accordance with Scientific Equipment and Furniture Association Standard SEFA 1.

1.5 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of fume hoods with other delivery of other laboratory furniture components.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.6 PROJECT CONDITIONS

A. 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 weathertight.
   2. Ceiling, overhead duct work and lighting are installed.
   3. All painting and floor tile located below casework is completed

1.7 WARRANTY

A. Warrant the sash counterweight system against defects in materials and workmanship for a period of two years from date of shipment. Any material or manufacturing defect in these components will be repaired without charge by the manufacturer.

B. Warrant that furnished products shall be free from defects in material and workmanship for a period of two years from date of shipment. Also warrant the products to be as represented and will repair or replace any part which examination discloses to have been defective within the warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers
LABORATORY FUME HOODS

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1. Mott Manufacturing Ltd. Harvard Series as distributed by New England Laboratory Casework Co., Inc. 781-932-9980. www.newenglandlab.com email info@newenglandlab.com

B. Products: Subject to compliance with requirements, provide the following products:
   1. Harvard Series.

2.2 MATERIALS

A. Steel: High quality, cold rolled, mild steel meeting requirements of ASTM A366; 14, 16, 18, and 20 gauge U.S. Standard.

B. Stainless steel: Type 304 or Type 316; 14, 16, and 18 gauge U.S. Standard.

C. Galvanized steel: 18 and 20 gauge, wipe coat finish.

D. Ceiling closure panels: Steel, painted of minimum 20 gauge; finish to match hood exterior.

E. Bypass system: Transparent laminated smoked safety glass bypass system allowing complete visual display of hood interior.

F. Fume hood glass: 6 mm thick laminated safety glass.

G. Sash chain: # 35 riveted case-hardened chain

H. Sash guides: Corrosion-resistant polyvinyl chloride.

I. Chain Assembly: Single axle locking system linked to a single full-width rear-mounted counterweight.

J. Sash pull: Full width stainless steel sash pull.

K. Fastenings:
   1. Interior fastening devices: Nylon bolts, PVC fasteners, PVC - capped stainless screws.
   2. Exterior panel member fastening devices: PVC - capped stainless steel screws.

2.3 FUME HOOD CONSTRUCTION

A. Hood Liner: Construct from the following material:
   1. White fiberglass reinforced polyester material. Min 3/16" thick

B. Airfoil Construction:
   1. Airfoils shall be constructed with a minimum clearance of 3/4" and equipped with power cord and tube pass-throughs near each side post.
   2. These pass-throughs shall allow sash handle to seal tightly against airfoil without running cords and tubes under the airfoil, but by simply resting cords and tubes into the pass-through cavity.
      a. All fume hoods come equipped with a 16 gage, 316-4 finish stainless steel airfoil with a minimum of 3/4" clearance from the work surface to insure maximum operating efficiency and minimum eddy effects.

C. Sash:
   1. Where drawings indicate a combination sash providing clear sliding horizontal panels no wider than 15”. Sash elements are sliding laminated safety glass set into an anodized aluminum bottom rail and track housed within the sash frame. (Bottom track sliding) A single steel rear-hung, counterweight system is used to insure non-tilting, non-binding, and non-creeping sash performance. Rear-mounted counter weight system shall be #35 case-hardened steel chain engaging a twin sprocket, single axle system with positive master link connection points both front and rear.

D. For hood stability and liner protection, hood sidewall and rear liner panels shall be mounted into 18 gauge galvanized steel pans fastened at all corners into a stable structure. Hood walls shall consist of an outer steel sheet, and a galvanized inner steel sheet, with the liner material fastened to the galvanized inner sheet steel to facilitate the fastening of burette rods and shelf brackets if needed.

E. All fume hoods are designed to eliminate air leakage around the sash and to conserve energy.
F. Three-piece main baffles shall provide controlled air vectors into and through the fume hood and be fabricated of the same material as the liner. Provide exhaust slots on the full perimeter of baffles. A stepped baffle design shall be used with consideration being given to reducing the plenum size after each baffle slot.

G. Fume hoods are designed to have an interior vertical clearance of 60" in the front twelve inches of the hood depth (Extra Tall) unless otherwise noted on drawings.

H. Hood Roof:
   1. The hood roof shall be fully framed and fabricated from the same liner material as the rest of the containment cavity.

I. Duct Collars: Exhaust outlet collars are fabricated of 18 gauge Type 316 stainless steel.

J. Interior Fastening Devices: All interior fastening devices are 410 stainless steel screws, PVC plastic fasteners, or nylon bolts.

2.4 FABRICATION

A. General: Design hoods to be highly fume resistant, for collection, retention and disposal of hazardous fumes with complete safety, minimum expenditure of purging air from room supply, and minimum turbulence within hood chamber.

B. Superstructure shall consist of galvanized steel pans holding liner and fastened together so that the entire structure is secure and rigid. Provide outer walls of the following material:
   1. Painted steel.

C. Airfoil: All fume hoods are equipped with a 16 gauge 316-4 finish stainless steel airfoil mounted 1" above the work surface of the fume hood. The space between the bottom of the airfoil and the work surface insures constant sweep across the work surface. The airfoil is shaped and formed the same as the top and sides of the fume hood's superstructure. The sash, when closed, sits on the airfoil and will not close off the opening under the airfoil.

D. Interior Lighting: Lighting shall be provided by LED module and driver located on the fume hood roof. Provide a 6mm (0.236") safety glass panel on hood "roof", sealed to isolate the lighting fixture from fume chamber. The LED module and driver combination shall be rated at 5900 lumens with a color temperature of 4000k. One nominal 22" (559mm) module shall be provided for each hood up to 6 foot in size with 8 foot models having two. Average interior illumination levels within the fume chamber shall be 80 foot candles minimum. Efficiency of light shall be 120 lumens per watt, and life expectancy of 50,000 hours.

E. Service Fixture Type:
   1. Provide fixtures that are panel-mounted remote control front loading, mounted at a 90 degree angle to the angled fascia post of the fume hood. The handles of the fixture are thus oriented toward the user's field of view and area of maximum dexterity. The valve body is easily removed for repair without entering the hood chamber.

F. Wiring: Specified electrical services are prewired to a junction box located on the roof of the fume hood for field connection by the electrical contractor. All services are 3-wire, 20-amp, 125/250 V.A.C. Face plates are stainless steel. Provide GFCI outlets with test and reset buttons.
   1. Provide light switch with stainless steel cover plate.

G. Working Surface: Provide the following:
   1. All fume hood work surfaces are dished 1-1/4" thick epoxy resin tops. Resin work surfaces have a 1/4" high raised edge on all four sides of the work surface. Work surfaces are non-glaring finish and grey in color.

H. Access panels:
   1. Exterior hood upper side panels are removable. Lower panels are fixed in place so that backsplash may be applied if necessary.
2. Provide interior access panels on both sides, and secure using special molded white vinyl gasket designed to be removed and reinstalled without use of special tools.

I. Accessories:
   1. Custom sash handle:
      a. Full width sash handle shall be integral to sash frame.
      b. Full width U shaped finger opening below frame, with hem underneath. No sharp edges.

J. Alarming
   1. Manufacturer should provide all necessary materials and interfaces to allow alarm with owners alarming system. Contracture shall coordinate fume hood with alarm systems in the low voltage drawings.

2.5 FUME HOOD EXTERIOR FINISH
A. Coating Performance data is available in Appendix 1 (attached)
B. Colors: Provide laboratory furniture paint finish in manufacturer’s standard colors. A one or two color scheme may be used.
C. Painted steel parts in the fume hood airfoil are unacceptable.
D. Stainless steel shall be supplied with a #4 finish free of burrs, weld marks, or other imperfections.

PART 3 EXECUTION
3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for hood layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install fume hoods and equipment in accordance with manufacturer's instructions.
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 re-attachment.
C. Coordinate sequence of work with mechanical and electrical trades and with related work as related laboratory casework and fixtures specified in Division 12 Section “Laboratory Casework.”

3.3 FIELD QUALITY CONTROL
A. Fume Hood Performance Testing Requirements: All hoods shall be tested to the latest version of the ANSI/ASHRAE 110 test procedure, and meet the requirements of ANSI Z9.5 of 0.10 PPM AI (As Installed)
B. Test hoods at designed face velocity: 80ft/min
C. Provide test reports in PDF format.

3.4 ADJUST AND CLEAN
A. Moving Parts: Carefully check and adjust moving parts to insure smooth, near-silent, and accurate sash operation with one hand and with uniform contact of rubber bumpers; ensure counter-balances operate without interference.
B. Clean surfaces, including both sides of glass.
C. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to Architect.
3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to present a training presentation on hood safety and use.

B. Provide a digital presentation containing instructional information on proper fume hood use and maintenance.

C. Provide a manual demonstrating proper fume hood use and maintenance.

END OF SECTION
SECTION 122113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL
1.1 SECTION INCLUDES
A. Horizontal slat louver blinds.
B. Operating hardware.

1.2 RELATED REQUIREMENTS
A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS
A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordinate the placement of concealed blocking to support blinds. See Section 061000.

1.5 SUBMITTALS
A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating physical and dimensional characteristics.
C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.
D. Samples: Submit two samples, 12 inch (305 mm) long illustrating slat materials and finish, cord type and color.

PART 2 PRODUCTS
2.1 MANUFACTURERS
A. Horizontal Louver Blinds:
B. Source Limitations: Furnish blinds and associated controls produced by a single manufacturer and obtained from a single supplier.

2.2 BLINDS
A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
2. Thickness: 0.008 inch (0.20 mm).
3. Thickness: 8 guage.
D. Slat Support: Woven polypropylene cord, ladder configuration.
E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
F. Headrail Attachment: Wall brackets.
2.3 FABRICATION
   A. Determine sizes by field measurement.
   B. Fabricate blinds to fit within openings with uniform edge clearance of 1 inch (25 mm).
   C. Fabricate blinds to cover window frames completely.
   D. At openings requiring multiple blind units, provide separate blind assemblies with space of 1 inch (25 mm) between blinds, located at window mullion centers.

PART 3 EXECUTION
3.1 EXAMINATION
   A. Verify that openings are ready to receive the work.
   B. Ensure structural blocking and supports are correctly placed. See Section 061000.

3.2 INSTALLATION
   A. Install blinds in accordance with manufacturer's instructions.
   B. Secure in place with flush countersunk fasteners.

3.3 TOLERANCES
   A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).
   B. Maximum Offset From Level: 1/8 inch (3 mm).

3.4 ADJUSTING
   A. Adjust blinds for smooth operation.

3.5 CLEANING
   A. Clean blind surfaces just prior to occupancy.

END OF SECTION
SECTION 123100  
FLEXIBLE LABORATORY FURNITURE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY:
A. This Specification identifies the minimum material and construction standards that are required to deliver a quality installation of the flexible laboratory furniture system. Laboratory furniture shall be supplied in accordance with the requirements of this Specification. The laboratory furniture identified in this Specification shall include the miscellaneous metal panels and other related components as identified on the drawings and that are necessary for the complete installation.

1.2 SECTION INCLUDES
A. Modular Support Structure  
B. Structural Table Base  
C. Mobile Base / Wall Cabinets  
D. Shelves  
E. Fixtures  
F. Service Connections

1.3 RELATED SECTIONS
A. Division 06 Section 10 00, “Rough Carpentry”  
B. Division 06 Section 40 00, “Architectural Woodwork”  
C. Division 12 Section 32 13, “Laboratory Casework”  
D. Division 22, “Plumbing Fixtures”  
E. Division 26, “Common Work Results for Electrical”  
F. Related Work To Be Performed By Others:  
   1. Final installation of all plumbing, service and electrical fixtures attached to service carriers.  
   2. Final connection to service lines of all plumbing, service and electrical fixtures attached to service carriers.

1.4 REFERENCES
A. SEFA 8: Laboratory Furniture - Casework, Shelving and Tables Guidelines  
   1. Science Equipment and Furniture Association (SEFA)  
   1. International Standards Organization (ISO)  
C. ADA (ATBCB ADAAG) Americans with Disabilities Act Accessibility Guidelines  
   1. Americans with Disabilities Act (ADA)

1.5 SUBMITTALS
A. Refer to Section 01 33 00, “Submittal Procedures,” for requirements, procedures, etc.  
B. Product Data:  
   1. Drawings shall include data and details for construction of the laboratory furniture as well as information regarding the name, quantity, type and construction of materials (such as hardware, gauges, etc), that will be used to complete the project.  
C. Shop Drawings:  
   1. The laboratory furniture manufacturer shall furnish shop drawings illustrating the layout and placement of all laboratory furniture, casework and fume hoods as well as any products included in this section.  
   2. Indicate the type and location of all service fittings and associated supply connections.
3. Preparation instructions and recommendations.
4. Storage and handling requirements and recommendations.
5. Installation methods.

D. Selection Samples:
1. Submit the following:
2. One complete set of color chips representing the manufacturer’s full range of available colors. Minimum sample size 2 inches by 2-1/2 inches (50mm x 76mm).

E. Quality Assurance/Control
1. Design Data/Test Reports: Manufacturer shall submit test data and design criteria which are in compliance with the project specifications.
2. Certificates: All certifications required in the specifications shall be submitted with the original submittal package under separate cover. Certificates must be provided with the signature of a qualified individual of the supplier.
3. Manufacturers’ Instructions: Provide manufacturer’s instructions for installation and maintenance of all products provided and installed within this section. Instructions will be in bound form, tabbed and organized by section number.

1.6 QUALITY ASSURANCE
A. Manufacturer Qualifications:
1. The following list of information will be provide to the Architect at least ten (10) days prior to the bid opening:
2. List of manufacturing facilities;
3. Construction details depicting the materials, sizes and methods of construction;

B. Mock-Ups
1. Area mockups shall be as indicated on the shop drawings. Post bid mockup areas must be priced for disassembly and reassembly and used within the project.
2. Do not proceed with remaining work until installation is approved by Architect.
   a. Install service carrier post assembly with specified hardware.
   b. Install service carrier body with specified hardware.
   c. Install all supports and cover panels as required.

1.7 DELIVERY, STORAGE AND HANDLING
A. Packaging, Shipping, Handling and Unloading
1. Packaging: Products shall have packaging adequate enough to protect finished surfaces from soiling or damage during shipping, delivery and installation.
2. Delivery: Casework delivery shall only take place after painting, utility rough-ins and related activities are completed that could otherwise damage, soil or deteriorate casework in installation areas.
3. Handling: Care such as the use of proper moving equipment, experienced movers, etc., shall be used at all times to avoid damaging the casework. Until installation takes place, any wrapping, insulation or other method of protection applied to products from the factory will be left in place to avoid accidental damage.

B. Acceptance at Site:
1. Casework will not be delivered or installed until the conditions specified under Part 3, Installation section of this document have been met.

C. Storage:
1. Casework shall be stored in the area of installation. If, prior to installation, it is necessary for casework to be temporarily stored in an area other than the installation area, the environmental conditions shall meet the environmental requirements specified under the Project Site Conditions article of this section.

D. Waste Management and Disposal:
1. The supplier of the laboratory casework is responsible for removing any waste or refuse resulting from the installation of, or work pertaining to laboratory casework; thereby leaving the project site clean and free of debris. Trash container(s) to be provided by others.

1.8 PROJECT SITE CONDITIONS
A. Building must be enclosed (windows and doors sealed and weather-tight);
B. An operational HVAC system that maintains temperature and humidity at occupancy levels must;
C. be in place;
D. Adjacent and related work shall be complete;
E. Ceiling, overhead ductwork and lighting must be installed;
F. Site must be free of any further construction such as “wet work”;
G. Required backing and reinforcements must be installed accurately and the project must be ready for casework installation.

1.9 WARRANTY
A. Furnish a written warranty that work performed under this section shall remain free from defects as to materials and workmanship for a period of two (2) years from date of shipment. Defects in materials and workmanship that may develop within this time are to be replaced without cost or expense to the Owner.
B. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained coating
   2. Discoloration or lack of finish integrity
   3. Cracking or peeling of finish
   4. Slippage, shift, or failure of attachment to wall, floor, or ceiling
   5. Weld or structural failure
   6. Warping or unloaded deflection of components
   7. Failure of hardware
C. The warranty with respect to products of another manufacturer sold by Mott Manufacturing is limited to the warranty extended by that manufacturer to Mott Manufacturing.

PART 2 - PRODUCTS
2.1 MANUFACTURER
A. Acceptable Manufacturer:
   1. Mott Manufacturing Ltd.; as distributed by New England Lab info@newenglandlab.com
      a. 3 Arrow Drive Woburn, MA 01801 781-932-9980
      b. Contact Eva Fishlin 781-503-8835 efishlin@newenglandlab.com
      c. Contact Rand Weyler 781-503-8817 rand@newenglandlab.com
B. Substitutions:
   1. Must meet all specification requirements and have prior approval.
   2. Must meet the minimum design and performance requirements of SEFA and UL 962.
C. Requests for substitutions:
   1. All requests will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS
A. Sheet Steel:
   1. Mild steel, cold rolled furniture grade to requirements of ASTM A1008/A1008M, Grade C or higher, with smooth surfaces to furniture quality.
B. Galvanized Sheet Steel:
C. Stainless Steel:
   2. Finish: Unless otherwise indicated, AISI No. 4 brushed finish.

2.3 DESIGN REQUIREMENTS:
A. *Basis of design: Mott Manufacturing Optima Series Table system*
B. Modular system shall be made of tubular style framing combined with D shape tubular formed steel uprights.
   1. To be used in island, wall or peninsula situations.
C. Tubular Frames: Table supports.
   1. Table supports to be adjustable height in 1” increments.
   2. Table support frames to have levelers equipped.
D. Rear frame to be used for carrying services and electrical conduit.
   1. Rear upright supports to be equipped with slots for adjustable shelving and levelers.
   2. All services must terminate at the top of the rear tubular support frame.
E. Assembled frame to be self supporting without needing to be anchored to the building.
F. The modular system must ship complete from the factory with minimal on-site assembly.
G. Double sided benches designed to be divided into two self-supporting single sided benches

2.4 2550 SERIES’ CONSTRUCTION (DOUBLE SIDED BENCHES)
A. Rear Support Structure:
   1. Nominal rear frame dimensions:
      a. Width: 48”, 60”, or 72”
      b. Depth: 6”
      c. Height: 84”
   2. Rear and Center Uprights:
      a. 2” x 6” 14ga. powder coated cold rolled steel or stainless steel
      b. Removable end panels shall be ordered separately
      c. Center uprights apply to units 60” or 72” wide to accommodate split shelving
      d. 2” diameter nylon leveling glide 3/8” x 2-1/2” long
   3. Upper and Lower Cross Rails:
      a. 11ga. Powder coated steel or stainless steel
   4. Load Capacity: Rear Upright to support up to 3 shelves loaded to a maximum of 180lbs per 12” deep shelf. The total load capacity for a single sided Rear Upright is 540lbs. The total load capacity for a double sided Rear Upright is 1080lbs.
   5. Uprights to house services, electrical and data cables.
      a. High voltage cabling to be in a separate upright from gas piping.
   7. Rear posts have slots punched on 1” increments starting at nominal 59” above the finished floor, to the top of the post.
B. Tubular Table Assembly:
   1. Nominal table assembly dimensions:
      a. Width: 48”, 60”, 72”
      b. Depth: Double sided assembly -58” (not including work surface)
      c. Height: Adjustable from 29” - 36” (not including work surface)
   2. Tubular Table Legs:
      a. 2” outside diameter, 14ga. powder coated cold rolled steel or stainless steel outer leg
      b. 1-¾” outside diameter, 14ga. powder coated cold rolled steel or stainless steel inner telescoping leg
      c. 2” diameter nylon leveling glide 3/8” x 2-1/2” long
   3. Capable of vertical height adjustment in 1” increments.
4. Table assembly shall be fastened to the rear upright with four (4) hex 3/8” socket head bolts.

5. Secondary table assembly shall be a four leg table designed to mate with the contoured uprights of the main table to form the appearance of one complete assembly with two work surfaces, while remaining independent and self-supporting. Interlocking hooks shall be provided to ensure that the entire assembly is stable. It shall be possible to move the secondary table to another location as use as an independent four-leg table.

6. Leveling Bolt: Frame shall be fitted with a leveling bolt which will allow the legs to be adjusted for proper alignment of work surface height.

7. Load Capacity: Table frame shall support the work surface plus 100lbs/linear ft of table length up to a maximum load rating of 800lbs.

C. Shelves:
1. Nominal shelf dimensions:
   a. Width: 36” max
   b. Depth: 14” Top, 12” for remaining shelves
   c. Thickness: 1”

2. Shelves shall be constructed of 1” thick balanced construction, finished both sides, high pressure laminate on medium density particleboard. Shelf shall be banded on all sides with 3mm thick PVC matching edge. Color to be selected from manufacturer’s standard solid colors.
   a. Acceptable Plastic Laminate manufacturers:
      1) Wilsonart
      2) Pionite
   b. Shelves shall have a 1” overhang behind the face of the rear tubular posts.
   c. Shelf brackets to be constructed of 14ga. powder coated cold rolled steel
   d. Shelves shall have a rear 2” high retaining lip attached to the back of the shelf rising 1” above the shelf. Top shelf assemblies do not require retaining lip.
   e. Bottom shelves to be supplied with 2.5” EDP grommet in three parts.
      1) Grommet ring shall be adhered to the hole in the shelf.
      2) Grommet cap shall drop in and cover the grommet ring, and contain a hinged wire door with a reduced cord slot opening.
      3) Wire door shall be hinged and removable and allow for wires to pass through.
   f. Vertical shelf adjustment in 1” increments.

D. Suspended/Mobile Base Cabinets:
1. Design and construction shall be as in section 12 35 53 - Laboratory Metal Casework.
2. Mobile cabinets shall have casters in lieu of a toe kick. Casters shall be rated for 165lbs minimum each and shall be locking type. Cabinet height must ensure 2-½” of clearance under the table frame.

E. Plumbing/Fixtures:
1. Rear upright structure to support a maximum of three plumbing fixtures.
2. Fixtures shall be double valve wye needle valve style with serrated hose ends.
3. Plumbing lines shall be ¼” copper tubing running the length of the upright.
4. Burning gasses not required for this project
5. All plumbing shall have quick disconnect at the top of the upright.
6. Plumbing shall be arranged in such a fashion that the services are keyed and cannot be intermixed.
7. All service valves and quick disconnects shall be keyed and color coded. Only plug and body connects of the same key will couple and allow flow.

F. Service Connections:
1. Electrical, data and plumbing services shall terminate at the top of the rear support upright.
2. Electrical services shall have a 20 amp cord extending 4’ above the top of the upright.
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SECTION 123213
LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SUMMARY
A. The subsequent specifications are designed to describe to the provider of the laboratory casework system the standards and expectations that the owner and architect allow for a quality and functional installation of the laboratory casework.

1.2 SECTION INCLUDES
A. Modular Casework.
B. Mobile Modular Casework.
C. Acid Safety Cabinets.

1.3 RELATED SECTIONS
A. Division 09 Section 65 13, “Resilient Base and Accessories”
B. Division 12 Section 31 00.4, “Manufactured Casework”
C. Division 13 Section 21 23, “Controlled Environment Rooms”
D. Division 22, “Plumbing Fixtures”
E. Related Work To Be Performed By Others:
   1. Final installation of all plumbing, service and electrical fixtures attached to casework or countertop (excluding piping and wiring within fume hoods).
   2. Final connection to service lines of all plumbing, service and electrical fixtures attached to laboratory casework or furniture.

1.4 REFERENCES
A. SEFA 8: Laboratory Furniture - Casework, Shelving and Tables Guidelines
   1. Science Equipment and Furniture Association (SEFA)
   1. International Standards Organization (ISO)
C. ADA (ATBCB ADAAG) Americans with Disabilities Act Accessibility Guidelines
   1. Americans with Disabilities Act (ADA)

1.5 SUBMITTALS
A. Refer to Section 01 33 00, “Submittal Procedures,” for requirements, procedures, etc.
B. Product Data:
   1. Drawings shall include data and details for construction of the laboratory casework as well as information regarding the name, quantity, type and construction of materials (such as hardware, gauges, etc), that will be used to complete the project.
C. Shop Drawings:
   1. The laboratory casework manufacturer shall furnish shop drawings illustrating the layout and placement of all laboratory casework and fume hoods as well as any products included in this section.
   2. Indicate the type and location of all service fittings and associated supply connections.
   3. Preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.
D. Quality Assurance/Control
   1. Design Data/Test Reports: Manufacturer shall submit test data and design criteria which are in compliance with the project specifications.
2. Certificates: All certifications required in the specifications shall be submitted with the original submittal package under separate cover. Certificates must be provided with the signature of a qualified individual of the supplier.

3. Manufacturers’ Instructions: Provide manufacturer’s instructions for installation and maintenance of all products provided and installed within this section. Instructions will be in bound form, tabbed and organized by section number.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. The following list of information will be provide to the Architect at least ten (10) days prior to the bid opening:
   2. List of manufacturing facilities;
   3. A list of ten (10) installations of comparable stature completed within the past 5 years;
   4. Construction details depicting the materials, sizes and methods of construction;
   5. Independent laboratory test reports that include information on cabinet, fume hood and table top finish and performance.

B. Mock-Ups
   1. Area mockups shall be as indicated on the shop drawings. Post bid mockup areas must be priced for disassembly and reassembly and used within the project.
   2. Do not proceed with remaining work until installation is approved by Architect.
      a. Install base cabinet with specified hardware.
      b. Install wall cabinet with specified hardware.
      c. Install workstation

1.7 DELIVERY, STORAGE AND HANDLING

A. Packaging, Shipping, Handling and Unloading
   1. Packaging: Products shall have packaging adequate enough to protect finished surfaces from soiling or damage during shipping, delivery and installation.
   2. Delivery: Casework delivery shall only take place after painting, utility rough-ins and related activities are completed that could otherwise damage, soil or deteriorate casework in installation areas.
   3. Handling: Care, such as the use of proper moving equipment, experienced movers, etc., shall be used at all times to avoid damaging the casework. Until installation takes place, any wrapping, insulation or other method of protection applied to products from the factory will be left in place to avoid accidental damage.

B. Acceptance at Site:
   1. Casework will not be delivered or installed until the conditions specified under Part 3, Installation section of this document have been met.

C. Storage:
   1. Casework shall be stored in the area of installation. If, prior to installation, it is necessary for casework to be temporarily stored in an area other than the installation area, the environmental conditions shall meet the environmental requirements specified under the Project Site Conditions article of this section.

D. Waste Management and Disposal:
   1. The supplier of the laboratory casework is responsible for removing any waste or refuse resulting from the installation of, or work pertaining to laboratory casework; thereby leaving the project site clean and free of debris. Trash container(s) to be provided by others.

1.8 PROJECT SITE CONDITIONS

A. Building must be enclosed (windows and doors sealed and weather-tight);

B. An operational HVAC system that maintains temperature and humidity at occupancy levels must

LABORATORY CASEWORK
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C. be in place;
D. Adjacent and related work shall be complete;
E. Ceiling, overhead ductwork and lighting must be installed;
F. Site must be free of any further construction such as “wet work”;
G. Required backing and reinforcements must be installed accurately and the project must be ready for casework installation.

1.9 WARRANTY
A. Furnish a written warranty that Work performed under this Section shall remain free from defects as to materials and workmanship for a period of two (2) years from date of shipment. Defects in materials and workmanship that may develop within this time are to be replaced without cost or expense to the Owner.
B. Defects include, but are not limited to:
   1. Ruptured, cracked, or stained materials
   2. Discoloration or lack of finish integrity
   3. Cracking or peeling of finish
   4. Slippage, shift, or failure of attachment to wall, floor, or ceiling
   5. Weld or structural failure
   6. Warping or unloaded deflection of components
   7. Failure of hardware

PART 2 - PRODUCTS
2.1 MANUFACTURER
A. Acceptable Manufacturer:
   1. Mott Manufacturing Ltd.; as distributed by New England Lab info@newenglandlab.com
      a. 3 Arrow Drive Woburn, MA 01801 781-932-9980
      b. Contact Eva Fishlin 781-503-8835 efishlin@newenglandlab.com
      c. Contact Rand Weyler 781-503-8817 rand@newenglandlab.com
B. Substitutions:
   1. Must meet all specification requirements and have prior approval.
C. Requests for substitutions:
   1. All requests will be considered in accordance with provisions of Section 01 60 00.

2.2 CASEWORK MATERIALS
A. Sheet Steel:
   1. Mild steel, cold rolled furniture grade to requirements of ASTM A1008/A1008M, Grade C or higher, with smooth surfaces to furniture quality.
B. Galvanized Sheet Steel:
C. Stainless Steel:
   1. Sheet: ASTM A240, Type 304 and 316 alloy.
   2. Finish: Unless otherwise indicated, AISI No. 4 Brushed Finish
D. Glass:
   1. Clear Float, 6mm and 3mm thick, conforming to CAN2 12.3-M76, Glazing Quality. Laminated Glass: CAN/CGSB-12.1-M90, Type 1 with clear PVB interlayer. Total nominal thickness of laminated glass: 6 mm.
E. Sealant:
   1. One component, RTV silicone sealant. Color to suit application.
F. Resilient Base and Adhesive:
1. Top set coved, 3mm (1/8") thick, 150mm (6") high and 100mm (4") high as indicated for base units, including pre-molded stops and external corners or color selected by Consultant from full range. Continuous lengths. Adhesive for rubber base shall be trowelled on giving 100% coverage. Use an adhesive compatible with both surfaces, as recommended by the base manufacturer.

G. Door and Drawer Fronts:
1. Door and Drawer Fronts: 3/4" high pressure laminate on medium density particleboard banded on all sides with 3mm thick PVC edge in one of the standard colors. Provide full overlay construction.
2. Acceptable Plam manufacturers:
   a. Wilsonart
   b. Pionite

2.3 CASEWORK CONSTRUCTION

A. Materials and Thickness:
1. Use the following minimum steel thicknesses for furniture manufacturing:
2. 3mm (11 Ga) leveling bolt gusset plates.
3. 1.9mm (14 Ga) drawer slides and side suspension channels.
4. 1.5mm (16 Ga) for tubular rails, legs for tables, gusset plates, cabinet top and intermediate horizontal rails.
5. 1.2mm (18 Ga) for door and drawer fronts, cabinet floor, cabinets sides, vertical front members, cabinet toe kick, service cover panels, table and kneehole frames, front rails, gable legs and dust caps, false panels, furring and filler panels.
6. 0.9mm (20 Ga) for drawer backs, door backs, vertical closure channel, removable back panels, shelves, drawer bodies, drawer dividers, bin bodies, and pull-out shelves.

B. Cabinet Frame:
1. Provide one-piece die-formed cabinet bottom construction with return side flanges turned down. Spot weld flanges to cabinet sides. Provide sink cabinets with galvanized bottom painted to match cabinet.
2. Cabinet bottoms shall be turned down at front to form 32mm (1-1/4") “U” channel to accept toe kick and turn down 133mm (5-1/4") at back with 16mm (5/8") return to form the back lower member of cabinet base. Provide punched 19mm (.75") dia. corner holes for access to levelers and to accept PVC press plugs. It shall be possible to access levelers from above cabinet without removing drawers or drawer supports.
3. Provide additional vertical 75mm (3") “HAT” shaped channels, spot-welded to or formed with the rear vertical corner. Channel shall be provided with pre-punched holes to receive shelf clips, and slotted holes to receive drawer suspension tracks. Cabinets 762mm (30") wide and larger shall be provided with intermediate 117mm (4-5/8") “HAT” channels to brace cabinet and accept shelf clips and drawer tracks.
4. Where applicable, the front corner posts shall be pre-punched and slotted to accept drawer suspension systems and suspension pull-out shelves. Front vertical posts shall form inboard flush front construction for doors and drawers acting as the cabinet main member side gable tying the cabinet bottom and horizontal member together to form a rigid case. Front post rear closure channels shall be “J” shaped 9mm (11/32") x 33mm (1-5/16") x 49mm (1-15/16"). Provide channel with pre-punched holes to receive shelf clips.
5. Doors and drawers shall overlay top intermediates and floor horizontal members.
6. Top horizontal front framing member shall form a “J” shaped section 75mm (3") wide, 10mm (3/8") return by 25mm (1") deep with 16mm (5/8") return.
7. Intermediate horizontal framing members shall form a “U” 32mm (1-1/4") high with a 25mm (1") return on top and 16mm (5/8") return on bottom.
8. Top rear horizontal framing member shall be 50mm (2") x 32mm (1-1/4") angle section welded to back corner lapped post and side gables with welded corner gusset plates acting as cabinet bracing and counter top material fixing member.

9. Enclose cabinetry toe space shall be 75mm (3") deep x 100mm (4") high and shall act as a total enclosure to bottom of cabinet. Toe space section shall key up into “U” shaped front floor member and act as reinforcement. Toe space, front floor of cabinet and corner post sections shall be spot welded together forming one structural member.

10. The toe space members, side gable returns, and back lower member shall form all welded structural corner to accept leveller gussets and 10mm (3/8") levelling bolts.

11. Cabinet construction shall be electro spot-welded to form a strong well-fitted, one-piece unit.

12. Exposed horizontal structural cabinet members between doors and drawers shall be unacceptable.

C. Base Cabinet Components:

1. Provide removable back panels for cupboard base cabinets. Provide partial back panels 229mm (9") in height to accommodate plumbing at sink units. When requested, provide back panels and security panels on cabinets requiring locks.

2. Shelving edges; turned down on all four sides 25mm (1"), and returned under on front and back 25mm (1"). Shelves 914mm (36") and longer shall be provided with "HAT‘ channel reinforcement at front edge.

3. Doors:
   a. Doors shall be of Plastic Laminate balanced construction on particleboard as described in section 2.2.G.1. Secure hinges to cabinet posts with machine screws and concealed self-locking Kep-nuts. Provide positive door closer by nylon roller friction catches, mounted on horizontal top or intermediate members pull side of doors. Provide each hinged door with 2 rubber bumpers.
   b. Doors, drawers, tracks and back panels shall be replaceable in the field without requiring special tools.
   c. All standard double door cabinets shall be designed without center stiles to maximize access to the cabinet.

4. Drawers:
   a. Drawer fronts shall be of Plastic Laminate balanced construction on particleboard as described in section 2.2.G.1.
   b. Provide drawer operation on Full Extension Drawer Slides, load capacity 45kg (100 pounds).: Equal to: Fulterer FR5000.OT.SMT
   c. Provide File drawer operation on Full Extension Drawer Slides, extension, load capacity 90kg (200 pounds).: Equal to: Fulterer FR5210.OT.SMT
   d. Drawer body shall consist of one piece construction including the bottom, two sides, back and inner front flanged end which shall be fastened to the interior drawer front head. Drawer bodies shall have a reinforcing bend on top edges.
   e. Provide built-in stops to prevent inadvertent removal of drawers, with allowance for drawer to be removed by lifting front of drawers and pulling out.
   f. Provide drawer pulls in central location of drawer face. Two handles shall be provided on units 762mm (30") and larger.

5. Mobile Cabinets:
   a. Mobile cabinets shall have casters in lieu of a toe kick. Casters shall be rated for 165lbs minimum each and shall be locking type. Cabinet height must ensure 2-½” of clearance under the table system frame.
   b. Provide welded finished solid tops and backs. Holes or fasteners in the back of the cabinet will not be accepted.
   c. Provide Fulterer interlocking drawer slides when mobile cabinets have more than one drawer.
   d. Provide anti-tip weights on all mobile cabinets with drawers.
e. Provide cabinets with ¾” thick epoxy tops to match worktop color.
f. Mobile cabinet drawer and door fronts as specified in 2.3 C 3 and 2.3 C 4

6. Tables
a. Fabricate tables from metal skirting panels formed into 95mm (3-3/4”) channel sections, and welded into a rigid frame construction. Notch corners and reinforce to receive 50mm (2”) square metal tubular legs bolted securely in place. Provide leg with 10mm (3/8”) leveling devices and slip-on type black PVC shoes.
b. Construct mobile tables the same as standard laboratory tables, except for the table legs which shall be designed to receive swivel casters.
c. Casters shall be as manufactured by Colson Casters. Casters shall be non-marking type urethane tires in grey color.
d. Table Bracing: Table bracing members shall consist of 25mm (1”) x 50mm (2”) removable tube members, installed between legs according to two table bracing configurations. Removable bracing shall be mechanically fixed to concealed “U” shaped mounting bracket welded on each leg. Where called for, provide table braces welded to legs as a fixed rigid bracing system.
e. Table Drawers: Where called for, drawers located in table aprons shall be supplied in a maximum width of 381mm (15”) with two drawers supplied in tables 1219mm (48”) and wider. Drawer suspension shall be with 25mm (1”) nylon ball bearing rollers and self-closing action, and custom manufactured 1.5mm (16 Ga) suspension system.

7. Leg Sets:
 a. Leg sets shall consist of two 50mm (2”) square metal tubular legs complete with steel bolt levellers and slip on PVC shoes.
b. Legs, when secured together, shall be provided with 25mm (1”) x 50mm (2”) steel rail centred 203mm (8”) up from bottom of leg.
c. Top of legs, both standing and sitting heights, shall have a 1.9mm (14 Ga) triangular mounting plate welded in position for securing to underside of countertop.

8. Apron Drawer Assembly:
 a. Apron drawer assembly shall be fabricated from metal channel shaped skirting panels of modular widths the same as standard base cabinets. Rails 95mm (3-3/4”) high channel ends shall be turned to fit into end mounting brackets. Drawer suspension framing shall be mechanically fixed to channels, welded integrally with front and back channel sections formed into a rigid one-piece frame.
b. Where called for, drawers located in table aprons shall be supplied in a maximum width of 381mm (15”) with two drawers supplied in tables 1219mm (48”) and wider. Drawer suspension shall be with 25mm (1”) nylon ball bearing rollers and self-closing action, custom manufactured 1.5mm (16 Ga) suspension system.

9. Front Rails:
 a. Front rail units shall be fabricated from a single metal channel-shaped skirting panel in modular widths the same as standard base cabinets. Channel ends shall be turned to fit into end mounting brackets. Rails are 95mm (3-3/4”) high.

10. Gable Legs:
 a. Gable legs shall consist of two telescoping side panels totally enclosed on all four sides and welded to form a strong rigid unit.
b. Gables shall be 38mm (1-1/2”) thick with 75mm x 100mm (3” x 4”) toe space and designed to be secured in a concealed fashion to the adjacent kneehole assembly or to the bench top material.
c. Gable legs shall be provided with two levelling devices.

11. Acid Storage Cabinets (molded liner)
 a. Construct in similar manner to standard steel base cabinets with the addition of a moulded polyethylene interior liner.
b. The lining on the back of doors shall be fitted so that it overlays the flange on the front of the moulded cabinet liner to protect all metal areas of the cabinet from corrosive vapours.

c. Acid storage cabinets shall contain one full-width shelf. It shall be possible to locate shelf in four positions on 75mm (3") increments. Shelf supports shall be integrally molded into cabinet liner.

d. Provide one door with decal signifying “ACID” storage

e. Molded liner shall incorporate a 25mm (1") high lip along bottom edge to contain spills.

f. Provide one threaded connection fusion welded to the rear of the cabinet. Thread shall be 50mm (2") NPT for connection to exhaust source.

g. Provide an entirely plastic door catch.

12. Control Panel Base Cabinets [457mm (18") or 559mm (22") optional depths]:

a. Constructed the same as standard base cabinets, except blank panels are provided above cupboard doors for the mounting of remote control fittings. Cabinet shall be complete with removable back panels.

13. File Drawer Cabinets:

a. Construct file drawer cabinets in similar manner to standard base cabinets, and consisting of 1 or 2 double height file drawers for low height or standard height file cases.

b. Provide each file drawer complete with 2 file supports and hanger rods.

c. The file drawer shall be provided with 508mm (20") full extension telescoping drawer tracks. Equal to: Fulterer FR5210.OT.SMT

d. Hanger rods are adjustable to accommodate legal or letter size files.

14. Service Cover Panels:

a. Service cover panels shall be provided, where called for, between base cabinets to enclose the pipe space. Service cover panels shall be designed in two sections. The lower section shall be fixed in place to mount cove base moulding. The upper section shall be fitted between the base cabinets and shall be removable.

15. Filler Panels:

a. Fabricate front filler panels complete with flanges on both sides and a 75mm x 100mm (3" x 4") toe space along the working face.

b. Scribe filler panels shall be flanged on one side and flat on the other, to be cut on jobsite to suit wall conditions, and shall fit into double angles secured to the wall. No visible mounting screws permitted.

c. Corner filler panels shall be a two-piece construction, one fixed panel and the other a variable panel to facilitate room dimensions. Each shall have flanges and an integral 75mm x 100mm (3" x 4") toe space filler to interlock with its counterpart.

d. End closing filler panels shall be flanged on one side 25mm (1") and secured to back of cabinet. The edge extending to wall shall be flat and fit into a double angle secured to wall. No visible mounting screws permitted.

16. Safety Storage Cabinets; Fume Hood Base Type (optional UL approved Model):

a. Construct storage cabinets of double wall, welded sheet steel construction with double panel door; overall thickness, 50mm (2"). Provide cabinets with 4 adjustable levelling devices to compensate for approximately 25mm (1") base building floor differential. Raise door sill 50mm (2") above bottom of the cabinet to form a liquid-tight well. Overlap cabinet frame with hinged doors having continuous piano type hinges with three-point locking mechanism ship lapped at opening stile. Shiplap shall be provided with braided fiberglass gasket.

b. Walls, back, side and top of cabinet shall be insulated with two inch (50mm) thick mineral fibre insulation.

c. Provide adjustable galvanized sheet steel shelves with four edges turned down 25mm (1") and additionally returned under 16mm (5/8") on all edges. Provide 13mm (1/2") incremental shelf adjustment.
d. Provide 50mm (2") vents, complete with fire baffle covers on each vent, with 50mm (2") dia. fine metal filter.

e. Provide overlaid red warning letters 50mm (2") high on doors as follows: "FLAMMABLE -- KEEP FIRE AWAY".


g. Construct safety storage cabinets sized for under-counter and under fume hood configurations as required by Drawings.

h. Cabinet shall be listed and labelled to the UL1275 standard.

D. Floor/Wall Cabinet Components:

1. Materials and Thicknesses:
   a. Use the following standard steel thicknesses for this furniture manufacturing:
      1) 1.2mm (18 Ga) leveled prime grade furniture steel for sides, top, back, bottom, false bottom, dust caps and bases on tall storage cabinets.
      2) 3mm (11 Ga) cold rolled steel for levelling device brackets on floor storage cabinets only.

2. Wall Storage Cabinets Sliding Glass Door or Open Type:
   a. Cabinet sides, bottom and top shall be flat panels die-formed "U" shaped flange on front edge and a return flange on back edges. Provide top and bottom panels with 40mm (1-9/16") flanges on both ends with double returns. Reinforce front flanges on both sides and top with a flanged "U" shaped member. Both front side stile reinforcing channels shall contain a vertical row of shelf support clip holes 5mm (3/16") round or square and 13mm (1/2") o.c. Reinforce bottom with "U" channel.

   b. Design of cabinet shall enable it to be easily converted to a sliding glass door cabinet.

   c. Wall cabinets shall be provided with an internally painted, flush bottom enclosure interlocking with front floor of cabinet as a telescoping panel with flange at rear and secured through the cabinet back.

   d. Provide shelves with edges turned down on 4 sides 25mm (1"), and return under on front and back by 25mm (1"). Provide shelf adjustment on 13mm (1/2") increments for full height of cabinet interior. Provide a minimum of four plated shelf clips per shelf. Provide shelves 914mm (36") and longer with "HAT" channel reinforcement at front edge.

   e. Provide sliding glass doors in 6mm (1/4") sheet glass with "H" shaped extruded aluminium shoes fixed to and running the full width of the door bottom. Provide vinyl glazing channel fixed into shoe. Provide 2 removable spring steel and nylon wheel assemblies, one located at each end. The door assembly shall run on an inverted double "Y" shaped extruded aluminium track. Provide each door at top with 2 PVC guides running in double "U" shaped extruded aluminium track. One finger pull per door shall be ground into glass on side of door next to cabinet frame.

   f. Install bumpers on vertical reinforcement members of the cabinet frame.

3. Wall Storage Cabinets; Sliding Metal Doors & Framed Glass Doors:
   a. Fabricate cabinet the same as in Para. 2.3.D.2.a. above, with modified front side posts to accept sliding metal doors, generally as specified in Para. 2.3.C.1.

   b. Doors shall be guided at the bottom with a full width black PVC double "U" channel fixed to floor of cabinet.

   c. Upper track for sliding metal and framed glass doors shall be galvanized; double-track, "V" grooved, and painted to match furniture. Provide 2 suspended rollers per door, with special set of brackets for fixing to sliding doors. Nylon rimmed ball bearing rollers as specified for drawer track assemblies.

   d. 3mm (1/8") glass shall be provided for frame glass doors.
4. Wall Storage Cabinets: Hinged Doors:
   a. Fabricate cabinets as specified in Para. 2.3.D.2.a. with two front side frames modified to minimize dust penetration. Provide intermediate exposed vertical members in a double “U” shaped channel. The front edges of the top panel shall have a channel formation reinforced with a flanged “U” channel. The exterior bottom panel shall have a channel formation at front and fitted with a flanged interior floor.
   b. Hinged metal doors shall be as specified in Para. 2.3.C.3.

5. Floor Storage Cabinets; Sliding Glass Doors and Open Type:
   a. Fabricate cabinet bottom as specified in Section 2.3.B.1., 2.3.B.2. and 2.3.B.3., with vertical height divided into two equal sections, each with a set of sliding doors and track system. Provide a finished floor full width and depth of interior with return flanges turned down on all four edges in both upper and lower sections and welded in place. Fabricate cabinet floor flush with front flange.
   b. Provide a shelf separating upper and lower sections, with 40mm (1-9/16”) flanges on all four sides, fixed and spot welded in place.
   c. Provide built-in toe space 100mm (4”) high extending full width of cabinet recessed back 75mm (3”) from front face with a 10mm(3/8”) diameter steel threaded bolt type levelling device in each corner.
   d. Provide sliding glass doors in 6mm (1/4”) sheet glass with “H” shaped extruded aluminium shoes fixed to and running the full width of the door bottom. Provide vinyl glazing channel fixed into shoe. Provide 2 removable spring steel and nylon wheel assemblies, one located at each end. The door assembly shall run on an inverted double “Y” shaped extruded aluminium track. Provide each door at top with 2 PVC guides running in double “U” shaped extruded aluminium track. One finger pull per door shall be ground into glass on side of door next to cabinet frame.

6. Floor Storage Cabinets - Hinged Doors:
   a. Construct cabinets as per Para. 2.3.B. and 2.3.C., and modified as in Para. 2.3.C.5.a.
   b. Hinged doors as per Para. 2.3.C.3. except when framed glass doors are needed. When framed glass doors appear on drawings, provide powdercoat steel framed doors, overlay construction.

7. Wall Shelving:
   a. Materials and Thickness:
      1) Wall pilasters shall be formed from 11 ga. material, 14 Ga. material, or 16 Ga. material. Single or double rows of slots shall be provided allowing shelf brackets to be adjusted in 1 inch increments.
      2) Shelf brackets shall be made from 14 ga. material or 16 ga material to hook in wall pilaster slots
      3) Shelves shall be of high pressure plastic laminate on particleboard with 3mm PVC matching edgeband on four sides to support the desired weight.
      4) Wall Vertical Post Structure:
         a) Provide vertical slotted channels 1-1/4" or 2-1/2" by 1" by 34-1/2" or 79" as required. Channels shall be constructed by 11 Ga. steel.
         b) The vertical post system shall be through secured to the wall material with appropriate fasteners to suit wall conditions.

8. Dust Cap:
   a. Dust caps shall be fabricated from 1.2mm (18 Ga) steel, and shall mount flush with the front edge of the cabinet and extend back at an angle of 30 degrees to a point perpendicular to the rear of the cabinet. Ends shall be finished and flanged so as to allow attachment to the cabinet below.

E. Cabinet Hardware
   1. Pulls: Provide handles for drawers and hinged doors in 4” wire pulls in stainless steel finish.
   2. Door Catches: Provide adjustable zinc-plated, spring-loaded, nylon roller.
3. **Strike Plates**: Provide strike plates fabricated of stainless steel, designed to be secured to cabinet stile without twisting, fixed with a single self-tapping screw.

4. **Door Hinges**: Provide five knuckle-type barrel door hinges of 14 Ga steel screwed into door and fastened to cabinet side stile with two counter sunk 8 - 32 cadmium-plated machine bolts & self-locking Kep Nuts. Overlay design.

5. **Locks; Base Cabinets**: Locks for doors and drawers on base cabinets, hinged doors on wall and floor-standing cabinets: Locks shall be 5 disc tumbler with master key capability. Cabinet Lock. Keys shall be removable in locked or unlocked positions.

6. **Locks; Sliding Glass Doors**: Slip-on ratchet type locks for sliding glass doors in chrome-plated steel. #963 by Knape and Vogt.

7. **Locks; Sliding Metal Doors**: Locks for sliding metal doors; chrome-plated steel. #C08042-26D by National Lock, Rockford, Illinois.

8. **Drawer and Hinged Door Bumpers**: Provide two tongue-type white rubber, press-fit bumpers per door or drawer.

9. **Sliding Glass Door Bumpers**: Provide 1" diameter, 1/8" thick felt bumper pads, adhesive on one side. Two pads per door.

10. **Provide interlocking drawer slides and anti-tip weights on mobile cabinets with more than one drawer.**

11. **Press Plugs**: Provide plugs for cabinet levelling device holes in floors in black PVC.

12. **Shelf Clips**:
   a. Clips for base cabinets, wall hung and tall storage cabinets; zinc-finished steel.

F. **Steel Furniture Finish**
   1. Paint Performance data is available in Appendix 1.

G. **Stainless Sink Base Cabinets**:
   1. Construction same as Painted Metal Steel Cabinets
   2. Use 304 Stainless Steel.

H. **Stainless Wire Shelving**:
   1. Stainless Steel Wire “Metro Style” Adjustable Shelves on Standards.
   2. Use 304 Stainless Steel.

I. **Stainless Benches**:
   2. 316 Stainless Countertops.
   3. Slides, casters.

2.4 **ACID SAFETY CABINETS**

A. **Basis of Design**: Justrite, https://www.justrite.com, product: "ChemCor Compac Corrosives/Acids Safety Cabinet", consisting of the following:
   2. Color: Blue.
   4. FM Approval: Yes.
   5. OSHA Compliance: Yes.
   8. Complies with NFPA 1 Fire-Code: Yes.
   10. Liter Capacity: 45.
   11. Number of Doors: 1.
   12. Door Type: Self-close.
15. Dimensions, Exterior: 35" H x 23.25" W x 18" D (889mm H x 591mm W x 457mm D).
16. Dimensions, Interior: 30.5" H x 20" W x 14.6" D (775mm H x 508mm W x 370mm D).
18. Net Weight, kg: 45.8.

B. Basis of Design: Justrite, https://www.justrite.com, product: "ChemCor Compac Corrosives/Acids Safety Cabinet", consisting of the following:
2. Color: Blue.
4. FM Approval: Yes.
5. OSHA Compliance: Yes.
8. Complies with NFPA 1 Fire-Code: Yes.
10. Liter Capacity: 15.
11. Number of Doors: 1.
12. Door Type: Self-close.
15. Dimensions, Exterior: 22" H x 17" W x 17" D (559mm H x 432mm W x 432mm D).
16. Dimensions, Interior: 18.5" H x 13.8" W x 13.8" D (470mm H x 349mm W x 349mm D).
17. Net Weight, lbs: 59.0.

PART 3 - EXECUTION

3.1 INSTALLERS
A. Installer Qualifications:
1. Installer shall have a minimum of 10 years continued experience in installation or application of systems similar to those required for this project.
2. Installer shall be authorized by either the distributor or manufacturer. Warranty will be void if unauthorized installer executes the installation.

3.2 EXAMINATION
A. Site Verification of Conditions:
1. Casework will not be delivered or installed until the following conditions have been met:
   a. Building must be enclosed (windows and doors sealed and weather-tight);
   b. An operational HVAC system that maintains temperature and humidity at occupancy levels must be in place;
   c. Ceiling, overhead ductwork and lighting must be installed;
   d. Site must be free of any further construction such as "wet work."
   e. Required backing and reinforcements must be installed accurately and the project must be read for casework installation.

B. NOTE:
1. In the event that any of the specified requirements for installation are not present at the time of requested delivery, the general contractor or owner must provide the casework manufacturer with a letter of deviation that releases the manufacturer from any responsibility or liability from an damage to the products resulting from the unfavorable building conditions.

3.3 INSTALLATION
A. Casework Installation:
1. Casework shall be set with components plumb, straight and square, securely anchored to building structure with no distortion. Concealed shims shall be used as required.
2. Cabinets in continuous runs shall be fastened together with joints flush, uniform and tight with misalignment of adjacent units not to exceed 1/16 of an inch.
3. Wall casework shall be secured to solid material, not lath, plastic or gypsum board.
4. Top edge surfaces shall be abutted in one true plane. Joints are to be flush and gap shall not exceed 1/8 of an inch between tops units.
5. Casework and hardware shall be adjusted and aligned to allow for accurate connection of contact points and efficient operation of doors and drawers without any warping or binding.

B. Countertop Installation:
1. Countertops are to have been fabricated in lengths according to drawings, with ends abutting tightly and sealed with corrosion resistant sealant.
2. Tops will be anchored to base casework in a single true plane with ends abutting at hairline joints with no raised edges at joints.
3. Joints shall be factory prepared having no need for in-field processing of top and edge surfaces.
4. Joints shall be dressed smoothly, surface scratches removed and entire surface cleaned thoroughly.

3.4 CLEANING
A. Ensure all products are unsoiled and match factory finish. Remove or repair damaged or defective units.
B. Clean all finished surfaces, including drawers and cabinet shelves, and touch up as necessary.
C. Countertops shall be cleaned and free of grease or streaks.

3.5 PROTECTION:
A. Counter tops and ledges shall be protected with 1/4 inch ribbed cardboard for the remainder of the construction process.
B. Examine casework for damaged or soiled areas; replace, repair, and touch-up as required.
C. Touch-up, repair or replace damaged products before Substantial Completion.
SECTION 123616
METAL COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY
A. The work of this Section consists of Section includes stainless-steel countertops, shelves, and
sinks where shown on the Drawings, as specified herein, and as required for a complete and
proper installation. Work includes, but is not limited to the following.

1.2 RELATED REQUIREMENTS
A. Drawings and general provisions of the Contract and Division 01 Specification Sections apply
to this Section.
B. Section 010000 - GENERAL REQUIREMENTS:
   1. Project environmental goals.
   2. Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints,
      coatings, and sealants.
C. Section 061000 - ROUGH CARPENTRY: Wood blocking.

1.3 REFERENCES
A. Referenced Standards: Comply with applicable requirements of the following standards and
those others referenced in this Section, under the provisions of Section 010000 - GENERAL
REQUIREMENTS. The standards referenced herein are included to establish recognized
minimum quality only. Where these standards conflict with other specified requirements, the
most restrictive requirements shall govern. Equivalent quality and testing standards will be
acceptable, subject to their timely submission, review and acceptance by the Architect.
   1. ASTM A 480 - General requirements Flat-Rolled Stainless and Heat-Resisting Steel Plate,
      Sheet and Strip.
   2. ASTM A 967 - Chemical Passivation Treatments for Stainless Steel Parts.
   3. ASTM A312/A312M - Seamless and Welded Austenitic Stainless Steel Pipes.
   4. ASTM A 666 - Stainless and Heat Resisting Chromium-Nickel Steel Sheet Strip, Plate and
      Flat Bar for Structural and Architectural Applications.
   5. ASTM A 167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and
      Strip.
   6. ASTM A 276 -Stainless and Heat- Resisting Steel Bars and Shapes.
   7. ASTM F 593 - Stainless Steel Bolts, Hex Cap Screws.
   8. ASTM F 594 - Stainless Steel Nuts.

1.4 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate work of this Subcontract with that of other trades, affecting or affected by this
      work, and cooperate with the other trades as is necessary to assure the steady progress
      of work.
   2. Be responsible for establishing locations and levels for all work of this Section, except
      such parts as may be delivered to others and set by them. In such cases assist them in
      properly locating said parts.
B. Field Measurements:
   1. Take field measurements before preparation of shop drawings and fabrication, where
      possible, to ensure proper fitting of Work.
   2. Allow for adjustments within specified tolerances wherever taking of field measurements
      before fabrication might delay Work.
C. Scheduling: Coordinate the work of this Section with the respective trades responsible for installing inserts and anchorages furnished by this Section; make arrangements for delivery, receipt and installation of inserts and anchorages to prevent delay of the Work.

1.5 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 010000 - GENERAL REQUIREMENTS:
   1. Product Data: Manufacturer's complete product data and specifications for all prefabricated items.
   2. Shop Drawings: Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.

B. Closeout Submittals: Submit the following under provisions of Section 010000 - GENERAL REQUIREMENTS.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver metal countertops only after casework has been completed in installation areas.
B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction to receive metal countertops by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316.
B. Sealant for Countertops: Manufacturer's standard sealant of characteristics indicated below that complies with applicable requirements in Section 079200 "Joint Sealants."
   1. Mildew-Resistant Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, silicone.
   2. Joint Sealant: Single component, nonsag, neutral curing, silicone; Class 25.
   4. Sealant shall have a VOC content of 250 g/L or less stretcher-leveled sheet.

2.2 STAINLESS-STEEL COUNTERTOPS, SHELVES, AND SINKS

A. Countertops:
   1. Methods: All factory welds shall be made using the TIG process. Filler rod shall be of the same composition as the base material
   2. Tops: Form tops with 1.25” high (32mm) edges with 0.5” (12mm) return flange. Reinforce with particle board wood core or metal hat channels as required. Form edges, flanges and backsplashes integrally from one sheet of steel. Intersections between backsplashes and work surface shall be radiused a minimum of 0.375” (9mm).
   3. Sink Tops: Form tops with 1.25” high (32mm) edges with 0.5” (12mm) return flange. Marine edges shall integrally formed on all edges. Marine edges shall be 1” (25mm) wide and 0.25” (6mm) high. Work surface shall be reinforced with wood core or metal hat channels as required. Form edges, flanges and backsplashes integrally from one sheet of steel. Intersections between backsplashes and work surface shall be radiused a minimum of 0.375” (9mm).
   4. Sink Bowls: Sink bowls shall be made of the same material as the work surface and shall be of equal or greater thickness. Sinks bowls shall be formed from one piece of steel with all inside corners radiused. Welds shall be hammered, ground and polished to produce a smooth, invisible joint. Sinks shall be welded into the work surface and welds shall be ground and polished to produce a smooth, invisible joint.
5. **Joints:** Factory welds shall be ground and polished to provide an invisible joint. Field connections shall be mechanical “tongue and groove” interlocking design with concealed bolts to provide a hairline seam.

6. **Sound Deadener:** Countertops and sinks shall have sound deadening material applied as required to the underside. Nominal thickness shall be 0.062” (1.5mm). Sound deadener shall be waterborne, non-flammable and shall contain no volatile organic compounds.

**B. Fabricate from 0.062-inch- (1.59-mm-) thick, stainless-steel sheet.** Provide smooth, clean exposed tops and edges in uniform plane, free of defects. Provide front and end overhang of 1 inch (25 mm) over the base cabinets.

1. **Joints:** Fabricate countertops without field-made joints and for long countertops, in sections for joining in field, with joints at locations indicated.

2. **Weld shop-made joints.**

3. **Sound deaden the undersurface with heavy-build mastic coating.**

4. **Extend the top down to provide a 1-inch- (25-mm-) thick edge with a 1/2-inch (12.7-mm) return flange.**

5. **Form the backsplash coved to and integral with top surface, with a 1/2-inch- (12.7-mm) thick top edge and 1/2-inch (12.7-mm) return flange.**

6. **Provide 24” high backsplash with 2” cavity at Central Sterile Processing Countertops, Refer to sheet A609-1A and A609-1B for elevations and sections at countertops.**

7. **Provide counter tops with backsplash and integral sinks at Satellite Frozen Section TG831, Refer to A603-7 for extent of scope in plan and elevations.**

8. **Provide the following edge conditions:**
   a. **Central Sterile Processing:**
      1) Marine Edge around perimeter of tops containing sinks; pitch tops containing sinks two ways to provide drainage without channeling or grooving.
      2) Square Bull Nose Edge at tops with no sinks.
   b. **Clinical Labs and Pharmacy Labs:**
      1) Square Bull Nose Edge at all tops.
   c. **All other spaces:**
      1) Square Bull Nose Edge at all tops.

9. Where stainless-steel sinks occur in stainless-steel tops, factory weld into one integral unit.

**C. Wall-Mounted Shelves:** Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Weld shop-made joints. Fold down or up the front edge a minimum of 3/4 inch (19 mm); fold up the back edge a minimum of 3 inches (75 mm). Provide integral stiffening brackets, formed by folding up ends a minimum of 3/4 inch (19 mm) and by welding to upturned front and back edges.

**D. Stainless-Steel Sinks:** Fabricate from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Slope the sink bottoms to outlet without channeling or grooving. Provide continuous butt-welded joints.

1. **Provide sizes indicated or manufacturer’s closest standard size of equal or greater volume, as approved by Architect.**

2. **Retain first subparagraph below for sinks with more than one bowl.**

3. **Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch (13-mm) diameter.**

4. **Factory punch holes for fittings.**

5. **Factory punch holes for Medical Gas and Electrical Outlets at Central Sterile Processing Countertops. Coordinate / Confirm final locations on shop drawings.**

6. **Provide sinks with stainless-steel strainers and tailpieces.**

7. **Provide sinks with integral rims except where located in stainless-steel countertops.**
8. Apply 1/8-inch- (3-mm-) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.3 STAINLESS-STEEL FINISH
A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish, with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal countertops.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Install metal countertops level, plumb, and true; shim as required, using concealed shims.
B. Field Jointing: Where possible, make field jointing in the same manner as shop jointing; use fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
C. Secure tops to cabinets with Z- or L-type fasteners or equivalent; use two or more fasteners at each front, end, and back.
D. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
F. Wall-Mounted Shelves: Fasten to masonry, partition framing, blocking, or reinforcements in partitions. Fasten each shelf through upturned back edge at not less than 24 inches (600 mm) o.c.

3.3 CLEANING AND PROTECTION
A. Repair or remove and replace defective work as directed on completion of installation.
B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over the countertop surfaces. Tape to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION
SECTION 132123
CONTROLLED ENVIRONMENTAL ROOMS

PART 1- GENERAL

1.1 RELATED DOCUMENTS
   A. The Bidding Requirements, Contract Forms and Conditions of the Contract, and applicable parts of DIVISION 1 - General Requirements, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Furnishing all labor, materials, equipment and services necessary to complete the controlled environmental room work, including compressor/condensing units unit mounted on building roof; and as scheduled on the Controlled Environmental Schedule attached to the end of this Section.
      2. Factory assembly and testing of major components prior to delivery, including air handler/evaporator, compressor/condensing unit, humidification/dehumidification equipment, and control panels.
      3. Delivery of room components to their final location, and complete assembly of rooms in place by factory-trained technician.
      4. Refrigeration piping, electrical power wiring, control wiring and connections to devices which are an integral part of the rooms.
      5. Connections to power supply.
      6. Connections to Data supply.
      7. Connection to ventilation.
      8. Frost control and humidification.
      9. Startup and filed testing of rooms by factory trained technical personnel.
   B. Coordinate fabrication and sizes of components with core/shell freight elevator dimensions to ensure that components can fit within existing elevator.

1.3 SYSTEM DESCRIPTION
   A. Design Requirements:
      1. Room shall be designed, manufactured, and installed by one supplier for single source responsibility.
      2. Rooms shall be self-contained units with all essential systems and equipment necessary for a complete and functional room, except that compressor/condensing units unit shall be remotely located on Building Roof as indicated on Drawings.
      3. Design systems with sufficient capacity to simultaneously and continuously meet all loads; including heat transmission from external sources, ventilation load, and internal heat gain from equipment, lighting and people; as scheduled under Part 3 of this Section. Scheduled power supply represents the amount of power allocated by the building electrical system design for each environmental room. Provide any additional power in excess of the amount scheduled that is required to maintain specified environmental conditions.
      4. The room design and installation shall conform to applicable codes, ordinances and regulations.
      5. Performance Requirements: Achieve the controlled environmental room conditions scheduled in Part 3 of this Section and maintain the conditions within the specified tolerances.

1.4 SUBMITTALS
   A. Product Data: For all environmental room components including panels, air handler/evaporator, compressor/condensing units, humidification/dehumidification equipment, and control panels.

CONTROLLED ENVIRONMENTAL ROOMS
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B. Shop Drawings: minimum scale 1/4 in. = 1 ft., which include dimensioned plans, elevations, and sections. Provide utility data, details, and other information required for proper evaluation of work and for coordination with other related work.
   1. Include, as a minimum, cooling, heating, and humidification/dehumidification requirements and capacities. Provide refrigeration piping schematic showing all components and their respective size or capacity, airflow schematic, and written sequence of operation.
   2. Show all power connections to lighting and equipment; the voltage, amperage, and KW load for each circuit; and control and power wiring schematics.
   3. Provide roughing-in requirements for mechanical and electric services.
C. Test Reports: Submit reports of all specified factory and field performance tests.
D. Operating and Maintenance Manuals: Before request for final payment, provide Operating and Maintenance Manuals that reflect installed conditions and provide detailed operating and maintenance procedures.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Engage an experienced factory trained installer who has completed work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance in the architectural, mechanical and electrical skills necessary to assemble and put the environmental rooms into operation.
B. Manufacturer Qualifications: Engage a firm with 10 years experience in manufacturing products similar to those indicated for this Project and with a record of successful in-service performance, and 10 installations of equal or larger size and with similar requirements.
C. Regulatory Requirements: Comply with the following National Fire Protection Association (NFPA) codes:
   1. NFPA 79, "Electrical Standard for Industrial machinery."
      b. NSF Standards: Comply with applicable NSF International (NSF) standards and criteria and provide NSF Certification Mark on room panels.
   3. ARI Compliance: Provide mechanical refrigeration systems complying with the Air-conditioning and Refrigeration Institute standard 420-77 and 520-78.
   4. UL Compliance: Provide wall panels complying with Underwriters Laboratories Inc., UL-723- Room Panel Flame Spread Ratings.
   5. FM Compliance: Provide wall panels complying with Factory Mutual, E84 Burn Test, Class 1 Rating, Aluminum Panels.
   6. GSA Compliance: Provide wall panels complying with Canadian Standards Association, C22.2.
   7. Single-Source Responsibility: Obtain environmental rooms and associated equipment from one source and by a single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING
A. Schedule delivery of environmental room components and equipment when building spaces are sufficiently complete so that material can be installed immediately following delivery.
B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.

1.7 PROJECT CONDITIONS
A. Do not deliver or install equipment until windows and doors are installed and the building is secure and weathertight.
B. Examine project conditions at the site with regard to access, dimensions and the general areas of work. Installation work shall be performed in close coordination with other trades.

C. Provide for any mechanical or electrical service different than that shown on the construction Drawings or indicated in these Specifications, but necessary to accommodate the manufacturer’s product requirements.

1.8 WARRANTY
A. General Warranty: The special warranty specified in the Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Provide a written warranty stating the product is free from defects in material or workmanship under normal use and service. Warranty shall become effective following the acceptance date and cover the following items for the noted duration:
   1. Ten year insulated panel warranty
   2. Five year compressor warranty
   3. One year parts warranty
   4. One year labor warranty

PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Subject to compliance with specified requirements, provide products by one of the following:
   1. Environmental Growth Chambers, Chagrin Falls, OH.
   2. Environmental Specialties, Inc., 4412 Tryon Road, Raleigh, North Carolina 27606; (919) 829-9300.
   3. Harris Environmental Systems, 11 Connector Road, Andover, Massachusetts 01810; (978) 475-0104 or (978) 729-5100

2.2 ROOM CONSTRUCTION
A. Wall and Ceiling Panels:
   1. Modular panel sections, 4 inches thick, consisting of foamed-in-place urethane insulation with interior and exterior metal surfaces. Provide panels in standard size increments, fully interchangeable, and in a configuration that meets the specified dimensions. Structural metal, wood, or fiberglass material shall not be used between interior and exterior surfaces.
   2. Interior and Exterior Surfaces: Smooth aluminum, minimum 0.04 inches thick, with baked enamel finish. Color selected by Architect.
   3. Insulation: Foamed-in-place urethane having a thermal conductivity ("K" Factor) not exceeding 0.118 BTU/hour/square foot/degree Fahrenheit/inch of thickness. The overall coefficient of heat transfer ("U" Factor) shall not exceed 0.029 (R-34) for 4 inch thick walls. Foam shall be 97 percent closed cell, impervious to moisture. Insulation shall bond the panel and have a minimum compressive strength of 28 pounds per square inch.
   4. Panel sections shall lock together from inside the room with cam-type fasteners, providing accurate, tight joining. A minimum of 3 locking devices shall be used on each vertical joint. Distance between locking devices shall not exceed 48 inches. Edge of panels shall be foamed-in-place, tongue and groove construction with every tongue including and interior and exterior foamed-in-place flexible vinyl gasket to ensure a tight fit. Batten strips or pressure clips as a means of covering seams or joining panel sections shall not be utilized.
   5. Each panel shall meet UL fire test rating with a flame spread rating of 25 or less and display the UL label for this rating. Panels shall be tested and approved by Factory Mutual, Standard Number 4880, for Class I building type, insulated wall and ceiling construction in combination.
6. Reinforce ceiling panels to support equipment loads without violating the insulation value of the panels. Reinforce wall panels to support wall mounted shelving shown on the Drawings. In addition to concentrated loads, panels shall withstand 60 lbs./sf live loads.

7. The floor shall be 4 in. thick panels with a 14 gauge galvanized steel top skin. Floor panels shall be capable of withstanding uniformly distributed load of 500 lbs./sf.
   a. Floor Finish: Altro Safety Flooring.

B. Doors:
   1. Infitting, semiflush, with a minimum clear opening of 34 inches by 78 inches. Provide with a minimum 18 inches by 12 inches insulated and sealed, 3-pane observation window, with a 1/4 inch air space between lites.
   2. Gaskets: Doors shall have a thermal resistance within 10 percent of that for wall panels. Extruded vinyl, resistant to oils and sunlight, and easily replaceable. Provide antisweat heaters to control condensation as a standard item on all door jambs at rooms designed for operation below 5 degrees Celsius.
   3. Hardware: Door hardware shall be similar to assembly Number D50 as manufactured by Dent Manufacturing. Polished aluminum, cam action type hinges, self-closing, self-lubricating, and edge or strap mounted with stainless steel. Pins and cam shall be Zytel. A minimum of 2 hinges per door, adjustable for proper gasket seal.
   4. Lock: Provide with keyed cylinder lock capable of release from the room interior whether or not the door is locked.

C. Closure Panels: Furnish and install the necessary vertical and horizontal closure panels, strips and shrouds to enclose opening between environmental rooms and adjacent corridor, building partitions, and ceiling. Finish to match adjoining environmental room wall panels.

2.3 ROOM INTERIORS

A. False ceiling Panels: Transparent, acrylic, eggcrate type. Underside of false ceiling panels shall be at 8 ft. - 0 in. AFF.

B. Ceiling Conditioning Plenum:
   1. Plenum to contain evaporator coils, fans, heating elements, control valves and other equipment necessary to condition the room air to maintain specified conditions.
   2. Conditioned air shall pass into a positive pressure plenum extending across the room ceiling. Plenum to provide the correct percentage of total opening to ensure uniform air distribution throughout the room.
   3. Construction: Corrosion resistant, hot dipped galvanized steel or aluminum. Service to the internal components shall be vial removable panels on the housing. The bottom of the housing shall also serve as a condensate drain pan and allow connection of the drain line without running exposed piping through the room. The conditioning plenum shall be completely pre-assembled, and tested prior to shipment, requiring only field connection to controller and condensing unit.

C. Lighting:
   1. Design: Lighting sufficient to provide 70 foot-candles (7531x) of uniform illumination when measured at 36 inches above the floor. Mount fixtures above the false ceiling panels.
   2. Fixtures: Vapor proof fluorescent type with low temperature ballast suitable for the temperature listed in the Environmental Room Schedule. Underwriters Laboratories approved, for room design temperature. Ballast shall be suitable for 120V/60hZ operation.
   3. Lamps: Provide type specified under Division 16.
   4. Switch: Provide with pilot light and locate next to door.

D. Electric Outlets: Provide GFI duplex outlets at floor level and at counter levels.
   1. Data Ports: Provide data ports as indicated.

2.4 REFRIGERATION SYSTEM

A. Design:
1. Complete remote building roof-top located compressor/condensing units, interconnecting piping, interconnecting wiring, and controls designed for continuous system operation. The refrigeration system shall be a fully modulating type which continuously proportions the mixture of liquid and hot gas phases of the refrigerant entering the evaporator. On/off solenoid valve type of control will not be acceptable.

2. System capacity shall be sufficient to simultaneously and continuously meet all loads, from 0 to 100 percent, including heat transmission from external sources, ventilation load and internal heat gain from equipment, lighting and people.

3. Refrigerant: R134A for rooms 4 degrees C.

4. Ventilation will be continuously provided from building supply air system. Rooms must maintain temperature control and uniformity with ventilation load continuously present.

B. Evaporator Unit:
   1. Coil: Copper tube, copper fin design with aluminum housing. Minimum 8 fins per inch, minimum 4 rows deep. Air velocity shall be less that 500 fpm.
   2. Coil Blower Motor: Ball-bearing design, rubber mounted, permanently lubricated and therally protected.

C. Compressor/Condenser Unit: Building Roof-top mounted, air cooled with semi-hermetic serviceable compressor. Equip with:
   1. High/low pressure control
   2. Receiver
   3. Vibration eliminating devices on suction and discharge lines
   4. Vibration isolators for compressor/condenser units
   5. Fusible Plug
   6. Fused disconnected switch
   7. Motor Starter
   8. Condensing unit shall be sized with 1% exclusion factor and shall have protective weather enclosures, cold weather package and suitable disconnect.
   9. All safety devices.

D. Refrigerant System Components: Refrigerant piping system to include the following components:
   1. Extension valve
   2. Modulating hot gas control valve
   3. Solenoid valves
   4. Hand shutoff valves
   5. Check valves
   6. Suction line filter
   7. Moisture indicating sight glass
   8. Liquid line dryer.

E. Automatic Defrost System:
   1. For rooms with setpoint temperature between 0 degrees Celsius and 6 degrees Celsius, provide hot gas bypass type system with timer and fan delay switch. Set defrost initiation time and duration so that room temperature increase is minimized (maximum 5°C) while achieving complete removal of accumulated frost. Electric heat trace and insulate drain pipe.
   2. Provide means of eliminating the defrost function when the room temperature is above 10 degrees Celsius.
   3. Timing and duration of defrost shall be programmed and controlled through the microprocessor temperature control.

F. Piping: ACR type, hard drawn, cleaned and capped Type L copper tubing soldered with silver solder. Hot gas piping shall be silver brazed. All piping shall be installed to allow for linear expansion of copper after startup.
Suction Piping: Size for velocity of 500-700 fpm on horizontal runs with a slight pitch toward condensing unit. When condensing unit is located below evaporator and there is no possibility of trapping oil; size vertical runs same as horizontal runs. When condensing unit is located above evaporator; size vertical runs for velocity of 1000-1500 fpm and install proper traps spaced not more than over 10 feet apart on all tubing risers.

2. Hot Gas Piping: When hot gas piping is field installed remote from compressor, size at same velocities and with same trap requirements as specified above for suction lines.

3. Liquid Piping: Size all liquid piping for maximum 2 psig pressure drop.

4. Hangers: Provide with appropriate tubing clamps to support liquid, suction, and discharge lines individually. Space hangers or clams 8 feet on center maximum.

5. Condensate Drain Piping: Provide 7/8 inch or greater, Type L copper tubing from evaporator drain pan to the building waste system. In rooms with sinks, drain piping shall be connected to the sink drain on the house side of the trap. In rooms without sinks, drain piping shall terminate 2 inches above the floor sink or floor drain outside the room. Horizontal piping between drain pan and wall shall be located above the false ceiling and pitched in the direction of flow. Rigidly support piping at walls, 3 feet on center with a 1 inch clear space between the wall and the drain line. Provide cleanout tee near drain pan. Where piping passes through wall of room, provide chrome plated escutcheons on bot faces of the wall and a trap seal at the outside surface of the wall. Provide insulated, heat traced piping for rooms at 2 degrees Celsius and below.

6. Refrigerant Testing: Pressurize and leak test entire system at not less than 100 psig. Clean and dehydrate by maintaining a vacuum of 500 microns, or lower, for a 5 hour period. Add required charge of refrigerant, and oil if necessary, and test entire system for performance. The type of refrigerant used shall be in accordance with State and Local Codes. Mark each system clearly as to refrigerant type used.

G. Insulation: Fire retardant, flexible unicellular type for insulating refrigeration suction and hot gas lines. Use minimum 1/2 inch thick wall. Apply during tubing assembly whenever possible.

2.5 VENTILATION SYSTEM

A. Ventilation supply and exhaust will be provided on a continuous basis from the building systems. Rooms must maintain uniform temperature control with ventilation load continuously present.

B. Provide a 4 inch diameter exhaust duct collar through the roof of the environmental room for connection to the building laboratory exhaust systems. Exhaust ducts shall be insulated for a minimum of 6 feet beyond the duct collar.

C. Provide a 4 inch diameter supply duct collar through the roof of the environmental room for connection to the building laboratory supply air system. Termination of the supply air duct in the ceiling plenum shall be at warm side of evaporator.

2.6 CONTROLS

A. Locate all instruments and controls in a control panel on the outside of the room. Controls shall be mounted at eye level. Provide panel with a clear acrylic cover and a lock with 2 keys. Provide control panel enclose all the way down to the floor to meet requirements of the Americans with Disabilities Act (ADA) Control panel shall have built-in service power disconnect switch by Room Manufacturer.

B. Main Temperature Control: Microprocessor based PID controller designed for environmental room applications with the following features:

1. Resistance Temperature Detector (RTD) 100 ohm platinum sensor for rapid response to temperature fluctuation, open tip for environmental rooms. Sensitivity shall be greater than or equal to plus or minus 0.1 degree Celsius.

2. The microprocessor PID controller shall continuously monitor room condition versus setpoint, providing an output which will modify the conditioning system capacity in response to any deviation.
3. Controller range shall be established to cover the required range of the room as scheduled.
4. Accuracy: plus or minus 0.25 percent of reading plus 1 digit over advertised span at 25 degrees Celsius.
5. Ambient Temperature Error: 0.01 percent of span per degree Celsius deviation from 25 degrees Celsius.
6. Resolution: 1 Degree/unit
7. Calibration Drift: Self-compensating for ambient temperature. All calibration values shall be stored in memory. No field calibration shall be required.

C. Humidity Control: Provide humidity control with steam generators and desiccant dryer as required to maintain design parameters.

D. Low temperature Safety Control: A separate and independent safety control circuit and devices shall be installed in the control panel. Its sole function shall be to deactivate the refrigeration system and activate audible and visual alarms in the event of a low temperature alarm condition. This control shall be a sensitive electronic controller with setpoint dial calibrated in degrees Celsius. A panel mounted momentary contact push button shall be provided to deactivate on the audible portion of the alarm. When temperature returns to the normal range the alarm system shall automatically reset. Provide dry contact for connection to external alarm.

E. Temperature Recorder: House in main control panel case and provide with a 10 inch circular chart capable of recording 7 days of operation with a -50 degrees Celsius to +75 degrees Celsius recording range. Ambient temperature error shall be no more than 0.04 percent of span per degree Celsius deviation from 25 degrees Celsius. Chart making shall be by means of a disposable felt tip pen. Input to the recorder shall be from a 100 ohm RTD sensor. The sensor shall be immersed in a glycerin solution and the container secured to the interior wall of the room.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of environmental rooms. Do not proceed with installation until unsatisfactory conditions have been corrected.
   1. Examine roughing-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION

A. Deliver to job site, uncrate, and assemble all equipment specified herein. All debris and crating materials shall be removed. Components shall not be exposed to weather.

B. Sections shall match without distortion. Door shall close and seal without binding.

C. Electrical:
   1. Furnishing, installation and connection of control panel, complete with disconnect for incoming service and branch circuits.
   2. Incoming service to control panel mounted disconnects form junction box located above the environmental room.
   3. Interlocking control wiring between control panel and remote compressors or heaters, between fan/coil unit and remote compressors or heaters, where required.
   4. Provide a dry contact, for use by building automation system, that will close when any of the operating controls fail or when any of the safety devices prevent operation of conditioning equipment.
5. Provide sealing fitting to seal conduit at all penetrations of environmental room wall or roof panels.

D. Mechanical:
1. Service line penetrations into rooms shall be properly sealed with silicone caulking.
2. Insulate the exhaust duct for a minimum of 6 feet beyond the collar.
3. Manufacturer of laboratory controlled temperature rooms shall provide carpentry supervisor and mechanical supervisor on job site whenever environmental room installation in that area of work on rooms is taking place.
4. Manufacturer's Representative shall instruct Owner's staff in the operation of room including controls, after completion of room startup. The operating and maintenance manual shall indicate sequential operation, startup and shutdown, with all pertinent control data and schematics.

3.3 PROTECTING
A. Provide final protection and maintain conditions, in a manner acceptable to Owner, manufacturer and Installer, that ensure environmental rooms and associated equipment is without damage or deterioration at the time of Substantial Completion.

3.4 FIELD QUALITY CONTROL
A. Provide all equipment and instrumentation for testing and perform the specified tests.
B. Control Setpoint: Verify temperature control of plus or minus 0.5 degrees Celsius at the room sensor.
C. Temperature Uniformity: Measure the temperature on a horizontal plane 40 inches above the floor and within 12 inches of wall throughout the entire room. Temperature uniformity shall be plus or minus 1 degrees Celsius. Measure and record uniformity using a multipoint strip chart recorder utilizing a minimum of twelve thermocouples during a continuous 24 hour test period.
D. Temperature Gradient: Verify that maximum temperature gradient from floor to ceiling does not exceed 1.0 degrees Celsius.
E. Recovery Test: All rooms, except freezers, shall recover preset operating temperature within 5 minutes after door has been fully opened to 75 degrees Fahrenheit ambient for a period of 1 full minute.
F. Internal Load Test: Each room shall maintain plus or minus 1.0 degree Celsius control when operating with the number of people, amount of ventilation, and internal heat gain of lighting and equipment as shown on the Environmental Room Schedule.
G. Provide written reports, in duplicate, of all tests. Reports shall indicate procedures followed, instruments used, and tabulation of results.
H. Witnessing of Tests: Owner's Representative shall be given the option of witnessing and confirming test results. Notify Owner's Representative, in writing, 10 days prior to tests.

END OF SECTION
SECTION 270000
COMMUNICATIONS

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 SCOPE OF WORK

A. General

1. This document describes the requirements for furnishing and installing a telecommunications cabling infrastructure: a balanced twisted-pair cabling system capable of supporting 10GBS ethernet networking is described.

2. Cables and related support, termination, and grounding hardware shall be furnished, installed, tested, labeled, and documented by the successful bidder as detailed in this document.

3. General product specifications, design considerations, and installation guidelines are provided in this document. Specific site-related requirements are provided as an attachment to this document. In case of conflict, this document shall take precedence. The successful bidder shall meet or exceed all requirements for the cabling system described in this document.

1.3 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

A. General

1. The facility shall be equipped with a telecommunications bonding backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current-carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations found in ANSI-J-STD-607-C, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

2. The main entrance facility/equipment room (EF/ER) in each building shall be equipped with a telecommunications main grounding busbar (TMGB). Each telecommunications enclosure (TE) and/or telecommunications room (TR) shall be provided with a telecommunications grounding busbar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent is to provide a telecommunications grounding system that is equal in potential to the building electrical grounding system. This will minimize ground loop current potential between telecommunications equipment and the electrical system that supplies power to the equipment.

3. All metal equipment racks, cabinets, backboards, cable shields, strength members, splice cases, cable trays, and the like entering or residing in TEs/TRs/ERs/EFs shall be grounded to the appropriate TGB/TMGB using a minimum 6 AWG stranded copper bonding conductor and compression connectors.
4. All wires used for telecommunications grounding purposes shall be identified with green insulation or green tape. Non-insulated wires shall be identified at each termination point using green tape. All cables and busbars shall be identified and labeled in accordance with ANSI-J-STD-607-C.

5. Contact the Integrated Network Communications department:

6. The wiring configuration for all telecommunications devices shall be T568B.

7. This document covers the cabling infrastructure for IS. Audio Visual cabling (if applicable) and colors shall be coordinated with the appropriate Owner contacts assigned to the project (if applicable).

B. Grounding and bonding system installation

1. The TBB shall be approved by the owner prior to installation. The TBB shall adhere to the recommendations found in ANSI-J-STD-607-C and shall be installed in accordance with industry best practices.

1.4 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

A. General

1. Labeling shall be in accordance with the recommendations found in TIA/EIA-606-B, the manufacturer’s recommendations/installation guides, and industry best practices. Refer to the Owner’s standard labeling scheme document to ensure labeling is complete the Owner’s labeling standards.

2. All labeling shall be printed labels on self-laminating cable labels.

3. Each faceplate jack, patch panel jack, ends of cable, wireless access point, Kronos clock and wall phone shall be labeled appropriately.

4. This contractor is responsible for mounting of Owner furnished access points. This contractor shall furnish and install the access point enclosures.

5. This contractor is responsible for patch cords at the station and patch panel end. Confirm with owner exact quantity and size.

1.5 SYSTEM DOCUMENTATION

A. General

1. Upon completion of the installation, the successful bidder shall provide three comprehensive sets of documentation to the owner of the complete telecommunications system for approval. Documentation shall include the items detailed below.

2. Documentation shall be submitted within 10 working days of the completion of each testing phase (e.g., subsystem, area, floor). This includes all test results and draft as-built drawings. Draft drawings may include hand-written annotations. Printer-generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the owner, the successful bidder shall provide copies of the original test results in electronic format, for example a Fluke Networks (*.flw) Linkware file or a Microsoft Excel (*.xls) file.
3. The owner may request a 10% random field re-test of the installed cabling system (at no additional cost) to verify documented findings. If the re-test findings contradict the documentation submitted by the successful bidder, additional testing can be requested to the extent deemed necessary by the owner, including a 100% re-test. This testing shall be at no additional cost to the owner.

1.6 TEST RESULTS DOCUMENTATION

A. General

1. The test equipment shall meet the requirements found in the TIA/EIA-568-C series of standards.

2. Test documentation shall be provided on permanent media within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or connector) ID, measurement direction, reference setup, and technician name(s). The test equipment name, manufacturer, model number, serial number, software version, and last calibration date will also be provided. Unless the manufacturer specifies a more frequent calibration cycle, proof of annual calibration must be documented for all test equipment used in this installation.

3. Printouts generated for each cable by the test equipment shall be submitted as part of the documentation package. Alternately, the successful bidder may furnish this information in electronic format on permanent media. The media shall contain the electronic equivalent of the test results as defined by the bid specification, in a file format such as Fluke (*.flw) Linkware file format or compatible with Microsoft Word or Microsoft Excel.

4. When repairs and re-tests are performed, the problem(s) found and the corrective action(s) taken shall be noted. Both the failed and passed test results shall be documented.

1.7 AS-BUILT DRAWINGS

A. General

1. Drawings must include cable routes and telecommunications outlet/connector (TO) locations. Each TO location shall be referenced by its unique identifier. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The owner or owner's representative(s) will provide scaled floor plans in paper and electronic (DWG, AutoCAD Release 14) formats, to which as-built construction information can be added. These documents will be modified accordingly by the successful bidder to denote as-built information as defined above and returned to the owner.

2. The successful bidder shall annotate the base drawings and provide both print (same plot size as originals) and electronic (AutoCAD 2014) versions of the modified files.

1.8 SCOPE

A. General
1. This document describes the requirements for furnishing and installing a telecommunications cabling infrastructure. A balanced twisted-pair cabling system capable of supporting 10 Gb/s Ethernet networking is described.

2. All cables and related support, termination, and grounding hardware shall be furnished, installed, tested, labeled, and documented by the successful bidder as detailed in this document.

3. General product specifications, design considerations, and installation guidelines are provided in this document. Specific site-related requirements are provided as an attachment to this document. In case of conflict, this document shall take precedence. The successful bidder shall meet or exceed all requirements for the cabling system described in this document.

1.9 REGULATORY REFERENCES

A. General

1. All workmanship and materials shall be in full conformance with applicable building, electrical, and other codes, as determined by the authority having jurisdiction (AHJ).

2. All cabling system components shall be Underwriters Laboratories (UL) or ETL Listed and shall be marked as such.

B. Reference list

1. The product specifications, design considerations, and installation guidelines provided in this document are in part derived from recommendations found in recognized telecommunications industry standards. The following are used as reference:

   a. Spaces and Pathways

      1) ISO/IEC 18010:2002 – Pathways and Spaces for Customer Premises Cabling

      2) TIA-569-D (2015) – Commercial Building Standard for Telecommunications Pathways and Spaces

      3) TIA-942-A (2012) – Telecommunications Infrastructure Standard for Data Centers

   b. Grounding

      1) ANSI-J-STD-607-C (2015) – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

      2) EN 50310, Application of Equipotential Bonding and Earthing in Buildings with Information Technology Equipment

   c. Cabling Systems

      1) ISO/IEC 11801 2nd Edition 12/07/07 Information Technology – Generic cabling for Customer Premises

1.10 GENERAL CONDITION – APPROVED VENDOR

A. General

1. The bidder must be an authorized Panduit Installer. The bidder must have successfully completed all Panduit design and installation training.

2. The bidder shall demonstrate proven expertise in the implementation of network cabling. Expertise can be illustrated through the inclusion of details of at least three projects involving the design and installation of a Category 5e, Category 6, or Category 6A balanced twisted-pair cabling system within the past two-year period. Names and contact information for each of the three projects shall be included.

3. The successful bidder shall hereinafter be referred to as the Vendor.
4. The Vendor shall accept complete responsibility for the design, installation, acceptance testing, and certification of the telecommunications system.

5. The Vendor shall provide proof of its current status as a Networking Contractor in Panduit’s certification program and shall deliver a warranty which includes a 25-Year Product Warranty and Lifetime Application Assurance for the installed system.

1.11 GENERAL CONDITION – APPROVED INSTALLER

A. General

1. All installation and testing shall be performed by a Networking Contractor (who is part of Panduit’s approved program) and supervised by individuals qualified to install and test the system, in accordance with Panduit requirements.

PART 2 - GENERAL CONDITION – APPROVED PRODUCTS

A. Approved products

1. Approved balanced twisted-pair cable:
   a. Cat 6A shall be plenum rated, blue in color. The manufacturer and P/N shall be either:
      1) Berk-Tek LanMARK-XTP Small Diameter 10G.
      2) Superior Essex Small Diameter 10Gain XP
      3) Mohawk Small Diameter GigaLAN10
      4) General GenSPEED 10 MTP Thin profile/Small diameter 10G

2. Modular Inserts and Icons
   a. Cat 6A inserts shall be Panduit manufactured, P/N CJ6X88TGBU (blue for category 6A)
   b. All inserts shall be 8 position, 8 conductor wired to a T568B configuration.
   c. Blank modular inserts for standard telecommunications outlet configuration shall match the faceplate color and be coordinated with the architect or see project specific documentation.

3. Cross Connect Wire.
   a. Coordinate with INC Project Manager prior to cross-wiring. The proper colors shall be determined prior to installation.
   b. VG224/VG350 cross wire cabling shall be manufactured by Superior Essex, Part Number 02-002-13
   c. One-Pair Blue/White shall be Anixter P/N J-1P24CBOD
   d. One-Pair White/Orange shall be Anixter P/N J-1P24CBOE
   e. One-Pair Red/White shall be Anixter P/N J-1P24CBOJ
   f. One-Pair Blue/Yellow shall be Anixter P/N J-1P24CBQA
   g. One-Pair Green/White shall be Anixter P/N J-1P24CBCC
   h. Two-Pair Blue/White & White/Orange shall be Anixter P/N J-2P24CBQE

4. Approved patch panels:
5. Approved Cross-Connect System:
   a. 300 Pair, 4-pair connector kit 110 Termination Blocks shall be Panduit manufactured P/N P110KB3004Y
   b. 300 Pair, 5-pair connector kit 110 Termination Blocks shall be Panduit manufactured P/N P110KB3005Y
   c. Five pair clips shall be used for backbone 110 blocks.
   d. Four pair clips shall be used for Horizontal 110 blocks.

6. Approved Patch Cords.
   a. All UTP patch cords shall be factory terminated.
   b. Category 6A patch cords at the rack and equipment end shall be blue 28 AWG small diameter and manufactured by Panduit P/N UTP28SP**BU whereas ** indicates the length of the patch cord.
   c. Category 6A patch cords at the workstation end shall be blue 24 AWG small diameter and manufactured by Panduit P/N UTP6ASD**BL whereas ** indicates the length of the patch cord
   d. VOIP wall phones require the use of a base to be mounted over the faceplate. These locations will use the patch cord which comes with the phone. Hanging studs are not required for VOIP phones. Category 6A patch cords will not be used for VOIP wall phones because the Category 6A cable (Minimum length of 3 feet) will not fit in the VOIP wall phone base. This is due to bend radius issues.

7. Approved workstation outlets:
   a. Angled faceplates are preferred. When used, contactor will provide icons for the hood of the angled port. Each icon will match the color of the associated jack. For example, a 2-port 6a faceplate will have two blue icons. One shall be snapped in above each insert.

   1) Plastic snap-in icon for category 6A faceplates/jacks shall be manufactured by Panduit (Blue).
   b. Typical VOIP faceplate configuration will include a 4-port faceplate with two cabled inserts on top to a patch panel and two blanks.
   c. Typical TDM and data faceplate will include a 4-port faceplate with one cabled insert for voice bottom left and two cabled inserts for data on the top.
   d. Faceplates

   1) Angled Four port faceplates shall be Panduit manufactured P/N CFPSL4xxY whereas xx indicates color.
   2) Angled Two port faceplates shall be Panduit manufactured P/N CFPSL2xxY whereas xx indicates color.
   3) Angled Six port faceplates shall be Panduit manufactured P/N CFPSL6xxY whereas xx indicates color.
   4) Flush Four port faceplates shall be Panduit manufactured P/N CFPL4xxY whereas xx indicates color.
   5) Flush Two port faceplates shall be Panduit manufactured P/N CFPL2xxY whereas xx indicates color.
6) Flush Six port faceplates shall be Panduit manufactured P/N CFP6LIW whereas xx indicates color.


8) Open Office cubicle faceplates shall be Panduit manufactured, P/N CFFP4xx along with MFFPExx faceplate extender whereas xx indicates color.

9) Adapter for Wiremold floor boxes shall be Panduit P/N CH12Mzz-X whereas zz indicates color.

10) Water resistant faceplate shall be Panduit manufactured, P/N CFPWR4CIG.

8. Copper Backbone Cable
   a. Copper backbone cable shall be plenum rated, category 3 multipair cable in 50 pair increments.
   b. Copper backbone cable shall be manufactured by: Berk-Tek, Belden, Mohawk, Panduit or General.
   c. All voice cabling shall be terminated on wall mounted 110 termination blocks.
   d. Provide and install wall mounted 12 inch wide tray vertically where cabling rises through building closets.

9. CATV Coax Backbone Cable
   a. Coaxial backbone cable shall be RG-11, plenum rated, coaxial cable.
   b. Coaxial cable shall be manufactured by CommScope.

10. Fiber Optic Cable
    a. Single mode Fiber Optic Cable
       1) A total of twelve (12) strands single mode fiber optic cable shall feed each IDF for the DFCI/PHS network.
       2) Fiber shall be:
          a) Berk-Tek P/N PDPK-012-AB0707.
          b) Mohawk Single mode 12 Strand Armored
          c) Superior Essex Single mode 12 Strand Armored
          d) General 12F 8.3/125 Single mode, 28e+ Armored 900um, Full Spectrum, low water peak P/N: AP0121PNU-ILPA.

11. Fiber Optic Termination Hardware
    a. 1 RU rack mounted fiber optic housing shall be Panduit manufactured, P/N FCE1U
    b. Single mode 12-port LC coupler panels shall be Panduit manufactured P/N FAP6WBUDLCZ.
    c. LC Fiber optic connectors shall be Panduit manufactured, P/N FLCSSCBUY.
    d. Blank coupler panels shall be Panduit manufactured, P/N FAPB. Must blank out unused space.

12. Equipment Racks & Cable Managers
    a. 45 RU floor mounted racks shall be 7’ High x 19” Wide
       1) Panduit manufactured P/N CMR19x84.
    b. 2RU Horizontal manager with cover shall be Panduit manufactured, P/N NMF2
c. 3RU Horizontal manager with cover shall be Panduit manufactured, P/N NMF3

d. 4RU Horizontal manager with cover shall be Panduit manufactured, P/N NMF4

e. 12-inch dual sided vertical wire manager shall be Panduit manufactured, P/N PEV12

f. Door for PEV12 shall be Panduit manufactured, P/N PED12 (2 required front and back) NOTE: must be mounted 2” from wall for door to hinge open.

g. NOTE: PEV Vertical managers shall me mounted to the rack using the front most holes on the manager. The front cable management fingers must be all the way back otherwise ports 1, 24, 25 & 48 are affected when using angled patch panels.

13. Cable Support and Management

a. Cable Runway in IDF rooms shall be Chatsworth manufactured P/N 11275-7xx whereas xx indicates width (or approved equal).

1) Wall angle support kit shall be Chatsworth manufactured, P/N 11421-7xx whereas xx indicates width (or approved equal).

2) Triangle wall angle support bracket shall be Chatsworth manufactured, P/N 11746-7xx whereas xx indicates width (or approved equal).

3) Rack elevation kit (6”) shall be Chatsworth manufactured P/N - 10506-706 (or approved equal).

4) Center support kit shall be Chatsworth manufactured P/N - 12730-7xx Mounting plate, black using hat-shaped bracket.

14. 110 Wall Mount Horizontal Cable Management shall be a bracket style.

15. Cable Support System shall consist of fastener assemblies. J-Hooks, system support bars and tri-hooks. Erico CAT425 saddlebag and CAT64HP high performance J-Hook shall be used for all 6A cables.

16. Cable management straps shall be Hook & Loop, tie-wraps are not permitted.

17. Flexible conduit into furniture shall be Hubbell Polytuff or approved equal, or Panduit split loom tubing, coordinate solution and trade size with Tel/Data engineer

18. Grounding and Bonding

a. The Contractor shall ground and bond installed system components per the manufactures recommendations.

1) The Telecommunications bonding conductor shall be Green insulated #6 AWG stranded copper ground wire from the racks & Ladder tray to the Main.

2) Panduit two-hole, long barrel copper compression lugs part number LCC6-14JAW-L for grounding conductors shall be color coded barrel. Utilize the Panduit CT1700 grounding crimp tool to complete the installation OR use pre-terminated factory Panduit bonding jumpers.

3) Telecommunications Grounding Busbar TMGB shall be Panduit part number GB2B0514TPI-1
19. Wireless Access Point Enclosures
   a. Provide one (1) wireless access point enclosure for each wireless access point on the floor plans.
   b. Wireless access points shall be by others.
   c. Coordinate ceiling type with owner for each required enclosure type.

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Vendor Item #</th>
<th>Item Description</th>
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<tbody>
<tr>
<td>OBERON</td>
<td>1011-00</td>
<td>Right Angle Wall Mounting</td>
</tr>
<tr>
<td>OBERON</td>
<td>1041-00</td>
<td>Concealed Spline Ceiling Mount</td>
</tr>
<tr>
<td>OBERON</td>
<td>1077-CCOAP</td>
<td>2’x2’ Ceiling Tile</td>
</tr>
<tr>
<td>OBERON</td>
<td>1065-CCOAP</td>
<td>Recess Wall/Ceiling Mount</td>
</tr>
<tr>
<td>OBERON</td>
<td>1068-00</td>
<td>2’x2’ Locking Ceiling Tile</td>
</tr>
</tbody>
</table>

PART 3 - WORK INCLUDED

A. General

1. The work included consists of all labor, equipment, products, and supplies required to design, install, test, and warranty the system in compliance with project specifications.

2. The work included consists of (but is not limited to) the following:
   a. Pre-registration of project with Panduit.
   b. Furnishing and installation of a complete balanced twisted-pair telecommunications cabling infrastructure capable of supporting 10 Gb/s networking.
   c. Furnishing, installation of, and termination of all cabling runs.
   d. Furnishing and installation of all TOs, patch panels, and cordage.
   e. Furnishing and installation of all required cable runways, cabinets and/or racks in TEs, TRs, and/or ERs.
   f. Furnishing of any other material required to implement a complete system.
   g. Testing all installed cabling runs and furnishing a summary report confirming the Pass status of each run.
   h. Furnishing all test and labeling information in both electronic and paper formats.
   i. Provide as-built drawings.

3.2 DRAWINGS SPECIFICATIONS

A. General

1. All drawings and plans provided with this document are diagrammatic. They are included to show the scope of the project in order to assist in the development of bid documents. The Vendor shall make allowances in the bid proposals to cover the work required to comply with the intent of the drawings and plans.

2. The Vendor shall verify all dimensions at the site and is responsible for their accuracy.

3. Prior to submitting a bid, the Vendor shall indicate:
   a. Any specified materials the Vendor believes to be inadequate.
   b. Any necessary items of work omitted from the bid specification.
3.3 PRE-PROJECT SUBMITTALS

A. General

1. Under the provisions of this document and prior to the start of work, the Vendor shall:
   a. Submit proof of status in the Partner Alliance Program of their company and the names of all individuals that will be performing the installation and testing to the owner of the system.
   b. Submit details of all cabling system products to be used to the owner.

2. Work shall not be performed without the written approval of the submitted items by the owner.

3. The Vendor must obtain approval from Panduit and from the owner for any substitution of submitted products. No substituted items shall be installed without written approval.

3.4 DELIVERY, STORAGE, AND HANDLING

A. General

1. Delivery and receipt of project materials shall be coordinated with the general contractor and owner.

2. All cable to be used in the project shall be stored according to manufacturer’s recommendations. In addition, all cable must be stored in a protected area. If cable is stored outside, it must be covered with opaque plastic or canvas for protection from the elements, with adequate ventilation to prevent condensation. If air temperature at the cable storage location will be below 4.4 °C (40 °F), the cable shall be moved to a heated location [minimum 10 °C (50 °F)]. If necessary, cable shall be stored off-site at the Vendor’s expense.

3. If the Vendor intends to provide a trailer on-site for the storage of project materials, prior approval must be obtained from the owner of the system.

3.5 STRUCTURED CABLING OVERVIEW

A. General

1. The system chosen shall meet the following specifications:
   a. The balanced twisted-pair cable shall be available in Bonded pair and non-Bonded pair configurations.
   b. The balanced twisted-pair cabling system shall support 10 Gb/s networking and shall provide guaranteed performance up to 625 MHz for a 4-connector, 295 ft channel.
   c. The balanced twisted-pair cabling system shall offer an option to handle up to 100 watts of power to support PoE Type 4 (90 W)

2. At a minimum, the balanced twisted-pair cabling system will exceed the key performance parameters for Cat 6A found in TIA/EIA-568-C.2 Category 6A standard over the specified frequency ranges by the values listed below. The balanced twisted-pair cabling system shall also meet all the requirements of ISO/IEC 11801:2002 Ed. 2 / Amendment 2

3.6 TESTING AND ACCEPTANCE

A. General labeling
1. All terminated cabling runs shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements found in the TIA/EIA-568-C series of standards. All pairs in each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation, including (but not limited to) cables, connectors, patch panels, and cording shall be repaired or replaced in order to ensure 100% usability of all installed runs.

2. Copper channel testing (see TIA-1152 TESTING STD)

3. All balanced twisted-pair cable links shall be tested for basic continuity and length, as indicated below. Additional testing shall be performed to verify compliance with Category 6A performance for the parameters listed in Section 27 10 11.01.B of this document. The extent of testing shall be in accordance with the end-customer's testing requirements. Test 100% of the permanent links for Insertion Loss, Return Loss, NEXT, PSNEXT and PSACRF. These tests are performed at the same time as the Continuity test using an automated tester, such as the Fluke DTX1800.

4. In addition, a random sampling of short length and long length installed links shall be tested for PSANEXT and PSAACRF. The links selected for testing shall follow the selection criteria specified in ANSI/TIA-568-C.2 standard.

5. In regards to the sampling size for alien crosstalk testing, the Networking Contractor shall test in accordance with the end-customer's testing/sampling requirements, or

6. Continuity – Each pair in every installed cabling run shall be tested using a test set that detects and identifies opens, shorts, polarity and pair reversals, crossed pairs, and split pairs. The results shall be recorded as Pass/Fail (as indicated by the test set) and referenced to the appropriate cable identification number and circuit/pair number. Any fault shall be corrected and the run re-tested prior to final acceptance.

7. Length – Every installed cabling run shall be tested for installed length using a time domain reflectometer (TDR) device. The cable length shall not exceed 90 m (295 ft). The cable length shall be recorded, referencing the cable identification number and circuit/pair number.

8. Category 6A performance testing shall be done according to the published standards.

3.7 WARRANTY AND SERVICES

A. Qualification of system

1. The installed system shall be covered by the Panduit warranty program. and delivered by the Networking Contractor.

2. Telecommunications spaces and pathways in new buildings or in those buildings having undergone major renovations in the preceding three years should conform to the recommendations outlined in TIA/EIA-569-B. In cases of installation in restrictive spaces and pathways (where it is not possible to implement the standards-based recommendations), no cabling run shall exceed 90 m (295 ft) in length nor be installed in any manner that limits the performance of the system.

3. The installed system shall conform to all applicable local building and electrical codes.

4. 25-year component warranty
3.8 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

A. Racks

1. All racks shall provide cable management and support elements for cordage at the front of the rack. They shall also provide cable management, support, and protection elements for the cables and/or equipment pigtails placed along the legs of the rack.

2. Free-standing racks shall be available in welded and knock-down assembly versions and equipped with two vertical and two universal channels.

3. Rack installation

4. Racks shall be securely attached to the concrete floor using a minimum 9.5 mm (0.375 in) hardware or as required by local codes.

5. Racks shall be placed with a minimum of 914 mm (36 in) clearance from the walls on all sides of the rack. When mounted in a row, there shall be a minimum of 914 mm (36 in) clearance from the wall behind the racks, in front of the row of racks, and from the walls at the ends of the row.

6. All racks shall be grounded to the TGB in accordance with Section 27 05 26 of this document.

7. Rack-mount fasteners not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

8. Rack-mount termination equipment shall be installed in accordance with the manufacturer’s recommendations and installation guides.

9. Wall-mount termination equipment shall be installed on 1.2 m x 2.4 m x 19 mm (4 ft x 8 ft x 0.75 in) void-free plywood. The plywood shall be mounted 0.3 m (1 ft) above the finished floor. The plywood shall be painted with two coats of white, fire-retardant paint. Fire rating stamp shall be left exposed.

10. Wall-mount termination equipment shall be installed in accordance with the manufacturer’s recommendations and installation guides.

3.9 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

A. Termination blocks

1. The termination block system shall provide a centralized termination, identification, and service assignment point for Cat 6A cabling and cordage in TEs/TRs/ERs.

2. The termination blocks shall meet and exceed TIA/EIA-568-C.2 short link requirements when terminated with 10G cable on front and back IDC interfaces.

B. Patch panels

1. The patch panel system shall provide a centralized termination, identification, and service assignment point for Cat 6A cabling and cordage in TEs/TRs/ERs.
2. The patch panels used to terminate the 4-pair balanced twisted-pair cable shall have the following characteristics:
   a. The patch panel offering shall be available in 48-port 2U angled configurations to address various density and cable management needs.
   b. The rear cable management for the patch panels shall be integrated in the design of the panel and require no additional accessories to dress terminated cables.
   c. The patch panels shall be equipped with 48 connectors.
   d. The transmission characteristics of the patch panels shall be guaranteed to 625 MHz for all ports.

C. Copper termination hardware installation

1. Cables shall be dressed and terminated in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.

2. The twisted pairs shall be guided, positioned and secured at the connector termination point using a termination device that locks the pairs in place to prevent untwisting of pairs into the cable when terminating the conductors.

3. The termination device holding the wires in place at the rear of the connector shall withstand a tensile force of 15 lbs. minimum applied to the cable without impacting the cable/connector continuity.

4. Cables shall be neatly bundled, dressed, and routed to their respective termination connectors. Each patch panel shall terminate a cable bundle separated and dressed back to the point of cable entrance into the equipment cabinet or rack.

5. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support element(s). Labels obscured from view shall not be acceptable.

3.10 COMMUNICATIONS COPPER HORIZONTAL CABLING

A. Horizontal cables

1. The cables will be available in plenum (CMP). The minimum recommended installation temperature shall be 5 °C (40 °F). The temperature rating shall be 60 °C (140 °F).

2. The minimum bend radius of the cable shall be 1.20 in (30.48 mm) for CMP and the CMR versions.

3. The cable conductors shall be 23 AWG solid copper.

B. HORIZONTAL CABLE INSTALLATION

1. Horizontal cables shall be installed in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.

2. A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb) shall be co-installed with the cable in any conduit.
3. Cable raceways shall not be filled greater than the TIA-569-D recommended maximum fill for the particular raceway type, of initially no more than 25%.

4. Cables shall be installed in continuous lengths from origin to destination.

5. All horizontal cables shall be supported at every 1.2 m to 1.5 m (48 in to 60 in) intervals. It is recommended that the support surface is rounded without any sharp edges and at least 2 inches wide. Do not exceed the manufactures recommended quantity of cables for the cable support system. At no point shall cable(s) rest on acoustic ceiling grids or panels.

6. Horizontal cables shall be bundled in groups of no more than 48 cables. Cable bundle quantities in excess of 48 cables may cause deformation of the bottom cables within the bundles, which will degrade the performance of those cables.

7. Cable shall be installed above fire-sprinkler systems and shall not be attached to such systems or any associated ancillary equipment or hardware. The cabling system and its associated pathways shall be installed so that they do not obscure any valves, fire alarm conduit(s), boxes, or other control devices.

8. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Vendor shall install appropriate carriers to support the cabling.

9. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Vendor prior to final acceptance at no cost to the owner.

10. Cables shall be identified by a permanent self-adhesive label in accordance with Section 27 05 53 of this document and TIA/EIA-606-B. The cable label shall be applied to the cable at both ends.

11. Balanced twisted-pair cable shall be installed so that there are no bends smaller than 4 times the OD of the cable at any point in the run or at the termination points.

12. The pulling tension on any 4-pair balanced twisted-pair cable shall not exceed 110 N (25 lbf).

3.11 COMMUNICATIONS FACEPLATES AND CONNECTORS

A. Outlets shall accommodate printed label strips for outlet identification purposes. Printed labels shall be permanent and shall comply with TIA/EIA-606-B. Hand-written labels shall not be accepted.

B. Faceplates

1. The faceplate housing the modular connector assemblies shall provide a symmetrically centered appearance for the modules.
   a. The faceplate housing the modular connector assemblies shall have no visible mounting screws.
   b. The faceplate housing the modular connector assemblies shall have built-in labeling windows to facilitate outlet identification.
   c. All plastic faceplates shall be made of UV-stable fire-retardant UL 94V-0 material.
C. Connectors

1. The modular jack assemblies used to terminate the 4-pair balanced twisted-pair cable shall have the characteristics listed below.

D. Work area installation

1. Work area TOs shall be installed in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.
   a. Cables shall be dressed and terminated in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.
   b. Slack cable shall be coiled in flush or surface-mount TOs if adequate space is provided to house the cable coil without exceeding the manufacturer’s bend radius limitations. In hollow-wall installations where box eliminators are used, cable slack can be stored in the wall. No more than 300 mm (12 in) of slack shall be stored in a TO, modular furniture raceway, or insulated wall. Excess slack may be loosely coiled and stored in the ceiling above each WA.
   c. The twisted pairs shall be guided, positioned and secured at the connector termination point using a termination bar that locks the pairs in place to prevent untwisting of pairs into the cable when terminating the conductors.
   d. Bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.
   e. Data outlets (unless otherwise noted in drawings) shall occupy the bottom positions on faceplates. Data outlets in horizontally oriented faceplates shall occupy the right-most positions.
   f. Wall phone outlets require 12” clearance on all sides of the edges of the faceplate to accommodate to Owner’s wall mounted phone assembly kit.

3.12 CABLES

A. COMMUNICATIONS PATCH CORDS, STATION CORDS, AND CROSS-CONNECT WIRE

B. Patch Cords

1. Provide one (1) 7’ patch cord for each jack at the patch panel end, blue.

2. Provide one (1) 10’ patch cord for 60% of the jacks at the station end, black.

3. The maximum cable diameter of the cordage shall be 6.73 mm (0.265 in). The minimum bend radius shall be 26.9 mm (1.06 in).
   a. The cordage shall be available in blue for Cat6A and White for Cat5e.
   b. The management bar technology of the modular cord shall have tightly controlled and centered plug NEXT performance. The tolerance on plug NEXT is within half the range specified in Annex G of the TIA 568-C.2 (Category 6A) standard for 3-6 / 4-5 pair combination.
   c. The transmission characteristics of individual cords and their corresponding channels shall comply with the requirements for Category 6A performance.

END OF SECTION 271000
SECTION 274100
AUDIOVISUAL SYSTEMS

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 DESCRIPTION OF WORK

A. The work of this Section consists of the provision of materials, labor, and equipment
   necessary and/or required for the complete execution of audiovisual equipment and related
   work for this project by the schedules, keynotes, and drawings including, but not limited to
   the following:
   1. Unless otherwise specified, supply only new equipment, parts and material, and
      protect equipment from construction dust and debris until final acceptance. Operate
      only for testing as part of installation procedure. Provision of manufactured
      components, installation, wiring, and testing is the responsibility of a single
      contractor.
   2. The system drawings indicate the general layout of the various items of equipment
      and their functional relationships. However, layout of equipment, accessories, and
      conduit systems are diagrammatic unless specifically detailed and do not
      necessarily indicate every item required for a complete installation. Provide
      incidental equipment needed to result in a complete and operable system even if not
      specified or shown on drawings without claim for additional payment.
   3. Quantities of major installed and portable equipment, including add- or deduct-
      alternates, are indicated on the system and electrical drawings. Quantities of
      portable equipment are indicated in schedules contained in the drawings or
      specifications; quantities of installed equipment are determined by examining the
      functional diagrams, plans, and riser diagrams.
   4. Refer to audiovisual conduit drawings for receptacle back box location and quantity
      information. Also, refer to architectural reflected ceiling plans for exact location of
      ceiling-mounted devices.
   5. Verify correctness of parts lists and equipment model numbers and conformance of
      each component with manufacturer's specifications.
   6. Obtain permits necessary for the execution of the work. Comply with applicable local
      codes and regulations.
   7. Provide inserts, panels, and cover plates.
   8. Supply and install strut channel hardware above finished ceiling for mounting of
      video projectors.

B. Functional Requirements of Systems:
   1. Conference Room
      a. The room will be used for computer based Video Presentations and Soft
         Codec Conferencing from the Room PC.
      b. The Video System will consist of a wall mounted flat panel display with a
         video camera mounted below.
      c. The sound system will consist of a sound bar mounted at the flat panel
         display for program audio.
      d. The AV systems will be controlled by a wall mounted button panel located
         near the presenter location.
   2. Private Offices
      a. The room will be used for computer based Video Presentations from a
         LAPTOP through a video connection at the wall below the display.
b. The Video System will consist of a wall mounted flat panel display.
c. Sound will be from the display.
d. Controlled will be from the TV remote.

3. Private Office with VTC
   a. The room will be used for computer based Video Presentations & Video Soft
      Codec (PC Based applications) meetings. A user supplied LAPTOP will
      connect via HDMI/USB at a video connection at the wall below the display.
   b. The Video System will consist of a wall mounted flat panel display with a
      video sound bar that includes speaker/microphone/webcam.
   c. Sound will be from the display.
   d. Controlled will be from the device remotes.

C. Specified Elsewhere:
   1. Metals (05 00 00)
   2. Rough Carpentry (06 10 00)
   3. Finish Carpentry (06 20 00)
   4. Heating, Ventilating, and Air-Conditioning (23 00 00)
   5. Electrical (26 00 00)
   6. Communications (27 00 00)
   7. Structured Cabling (27 10 00)

D. Definitions:
   1. Owner:
   2. Architect:
   3. Consultant: e3i Engineers
   4. Bidder: Audiovisual contractor or other entity generating the response to this set of
      audiovisual bid documents.
   5. Audiovisual Contractor or Contractor: Company responsible for work under this
      section.
   6. Furnish: procure, and deliver the equipment to the job site, freight prepaid, for
      receipt, staging, and installation by others.
   7. Install: Provide, store, unpack, and securely attach or mount equipment to structure
      following industry standards, approved shop drawings, and manufacturer
      recommendations.
   8. Provide: Furnish and Install equipment.
   9. Provided by Others and Not in Contract (NIC): Work related to this contract but will
      be provided by parties other than the AV Contractor.
   10. Owner-Furnished Contractor Installed (OFCI) or Owner-Furnished Equipment
       (OFE): Equipment furnished by the Owner for installation by the Audiovisual
       contractor. The Audiovisual contractor shall be responsible for installing and
       integrating this equipment as detailed herein.
   11. Installation Materials: Installed cable, loose cable, terminations, cable management,
       voice/data/video patch cords, adapters, I/O panels, cable dressing, lacing bars,
       copper bus bars, labels, rack shelves, rack mounts, power strips/distribution, and
       other materials as needed to install the systems.

1.3 SUBMITTAL REQUIREMENTS

A. General:
   1. Contractor must provide four submissions as described in this specification. Those
      submissions include:
      a. Bid submission
      b. Shop drawing, bill of materials, and programming
      c. Test reports
      d. As-Built drawings and operation manuals
2. In keeping with the practices of LEED™, submittals shall be delivered in electronic format as Excel *.xls or *.xlsx, AutoCAD *.dwg (with bound XREFs), Revit *.rvt (with imported files), Word *.doc or *.docx, or combined PDF files via FTP posting, DVD, USB flash drive, or e-mail.

3. Delivery Schedule:
   a. Bid submittal package: By date specified, to include:
      1) Basis of bid documents, including:
         a) Itemized equipment costs for specified equipment or APPROVED substitutions.
         b) Qualifications/References
         c) Certifications (including certificate of bonding, if required)
         d) Proposed payment terms
   b. Bill of material submission: No later than 30 days following award of contract provide the following as one unified package:
      1) Bill of materials
      2) Manufacturer product data sheets
   c. Shop drawing submission: No later than 30 days following award of contract provide the following as one unified package:
      1) Shop drawings
      2) Control system layouts and digital signal processing configurations.
   d. Test result submission: One week before acceptance testing provide the following:
      1) System test and certification reports
      2) Owner’s manuals with manufacturers’ equipment manuals
      3) One (1) draft copy of user operational manuals
      4) One (1) draft copy of "as-built" system diagrams
   e. As-built drawings and operational manual submission: Within 30 days after final acceptance testing visit provide the following:
      1) Final as-built system diagrams in hard copy and editable electronic file formats.
      2) Final user operational manuals in hard copy and editable electronic file formats.
      3) Control software for AV Control System, digital signal processors, and other programmable devices. Include complete job-specific source code files.
      4) Custom finish material samples, if applicable.

4. Unless otherwise directed by contract, do not order equipment until the bill of materials has been reviewed and approved by the AV consultant.

5. Approval for isolated items will not be considered, except by prior AV consultant authorization.

6. Rejected items and items requiring correction must be resubmitted together, unless authorized otherwise.

1.4 BID SUBMITTALS

A. Instructions to Bidders: To be considered, Bids must be made in accord with the Architect's Instructions to Bidders and this Article.

B. Examinations: Carefully examine the contract documents and the construction site to obtain first-hand knowledge of existing conditions. Contractors will not be given extra payments for conditions that can be determined by examining documents on-site and will not be relieved of obligations with respect to bid.

C. Equipment for the project is shown on the plans, reflected ceiling plans, elevations, and functional diagrams. The contractor must develop a list of equipment for each type of space detailed on the drawings. Contractor is responsible for providing miscellaneous parts.
to provide a complete and working audiovisual system in each of the spaces outlined in the drawings.

D. The system was designed around the Crestron control system. AMX or Extron is an acceptable substitute. The contractor will be responsible for providing the equipment necessary to provide a complete system if AMX or Extron is provided.

E. Questions: Submit questions about the contract documents in writing. Replies requiring changes to the contract documents will be issued to bidders as addenda and will become part of the Contract. The Architect and Owner may give but will not be responsible for oral clarifications. Questions received less than 10 days before bid date cannot be answered in writing.

F. Acceptable Products: Model numbers and manufacturers identified herein indicate a standard of quality and performance. Other products will be considered, subject to approval of complete technical data, samples and results of independent testing of proposed equipment, submitted in accordance with Division 1 requirements and “Substitutions” section below.

G. Substitutions: To obtain approval for substitutions and for items identified as "approved equal", submit written requests at least 10 days before bid date. Requests received after this time will not be considered. Requests shall clearly describe the product for which approval is asked, including data necessary to demonstrate acceptability. If the product is acceptable, an Addendum may be issued to bidders.

H. Equipment Availability: Verify with manufacturers availability and cost of equipment proposed, including equipment specified herein. No cost increases will be allowed for manufacturers’ cost increases, or for substitutions required because of unavailability of proposed equipment.

I. Performance Bond: The successful bidder will furnish a Performance Payment Bond and Labor and Material Bond, underwritten by a surety company approved by the Architect and Owner, for fulfillment of provisions of the contract.

J. Basis of Bids:
   1. Submissions will be provided in electronic format described below. Electronic submissions must be supplied in Microsoft Excel. *.xls or *.xlsx format.
   2. Include a complete itemized list for each base-bid system indicating the manufacturer, model number, unit cost and total costs for specified items. Itemization of miscellaneous equipment such as cable, switches, and receptacles is not required.
   3. Clearly indicate the total cost, including expenses, for each individual system to allow the Owner to select the systems to be included in the contract. Itemization of miscellaneous equipment such as cable, switches, and receptacles is not required.
   4. At the end of each list indicate the cost of other items, such as for miscellaneous equipment, engineering, installation labor, overhead, taxes, etc.
   5. On a separate list, indicate costs of add- or deduct-alternates with the information presented in the same manner as for the base-bid system.
   6. Include a listing of voluntary alternates proposed by the bidder as substitutions or additions to the specified systems.
   7. Include notes or comments to qualify the bid.
   8. Identify sub-contractors and indicate the work they are to do.
   9. Provide documentation of ability in installing similar systems. Furnish the names, addresses, and telephone numbers of the System Designer, Architect, General Contractor, and Owner on three projects similar in scope, which the Contractor has installed within the last 5 years.
   10. Include certification of ownership and full familiarity with the operation of the following minimum test equipment

AUDIOVISUAL SYSTEMS
274100-4
K. QUALITY ASSURANCE

1. Project Management: Maintain the same person in charge of work throughout installation.
2. Contract Documents: Maintain a complete set of system drawings and specifications at the site during installation.
3. Fabrication and Installation: Completely fabricate equipment racks and subassemblies in contractor fabrication shop. Make field connections of audio, video, and control wiring including microphone, line level, loudspeaker, video, and control system circuits to equipment, equipment racks, and connection panels. Continuously supervise the installation and connection of cable and equipment.
4. Contractor Qualifications: To be considered qualified for this work; the contracting firm must be experienced in the provision of audiovisual systems similar in complexity to those required for this project, and meet the following:
   a. The Contractor’s primary business is the provision, fabrication, and installation of professional audiovisual and related systems.
   b. The Contractor has been regularly engaged in the installation and service of professional audiovisual presentation systems for a period of at least five years.
   c. The Contractor is an authorized dealer for the specified Audiovisual Control System systems.
   d. The contractor employs a Platinum Master programmer for programming Crestron systems, an Extron Control Professional, and/or an ACE Design Expert programmer for programming AMX systems.
   e. The Contractor is, at a minimum, CAVSP Basic level certified solution provider, with at least (1) CTS-I and (1) CTS (or C-EST) certified employee on-site for the duration of the installation.
   f. The contractor has a Crestron DigitalMedia Certified Engineer (DMC-E), Extron XTP Systems Design Engineer, or AMX ACE Certified Installer onsite during the installation and termination of HDBaseT (DigitalMedia, XTP, DTP, or DGX) equipment.
   g. At the request of the Architect, demonstrate the following capabilities:
      1) Adequate plans and equipment to complete the work.
      2) Staff with appropriate technical experience to oversee and execute the work.
   h. The Contractor may arrange for sub-contract field and special shop work to be done by others.

1.5 SUBSTITUTIONS

A. General:
   1. The Contractor has the burden of proving, at the Contractor’s own cost and expense and to the satisfaction of the Architect, that the proposed product is similar and equal to the named product.

B. Basis:
   1. Requests for acceptance of proposed equivalents made following the award of bid will be considered by the Architect only in the following cases:
      a. The named products cannot be obtained by the Contractor because of strikes, lockouts, bankruptcies or discontinuance of manufacturer and the Contractor makes a written request to the Architect for consideration of the proposed equivalent.
      b. The proposed equivalent, in the opinion of the Architect, is equal or superior to the named product and its use is to the advantage of the Owner.
      c. A formal request must be made for the substitution documenting fully the above reason. Include complete data on the proposed substitution substantiating compliance with the Contract Documents including: product
identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified or named by Addenda, with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to separate contracts. Accompany the request by accurate installed cost data on the proposed substitution in comparison with the product specified.

C. Consideration:

1. A request for substitution is a representation by the Contractor that:
   a. The Contractor has personally investigated the proposed substitution and determined that it is equal or superior to that specified.
   b. The Contractor will provide the same warranty for the substitution that would be for that specified.
   c. The cost data presented are complete and include related costs under this Contract but exclude costs under separate contracts and exclude Architect’s re-design costs, and that the Contractor waives claims for additional costs related to the substitution, which subsequently become apparent.
   d. Indicate if there will be cost impact on work by other trades.
   e. The Contractor will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete.
   f. Change Order modifying the Specifications will document an accepted substitution. The Contract Price will be changed only if the substitution results in cost savings to the Owner.

1.6 SHOP DRAWING AND BILL OF MATERIAL SUBMITTALS

A. Coordinate submittals with requirements set forth in Section 00 10 00 Solicitation.

B. CAD drawings will be in current AutoCAD .dwg format (with bound XREFs) or portable document format (PDF). Other submissions will be provided as PDFs, unless otherwise stated.

C. Shop Drawings and Bill of Materials Submittals:

1. General:
   a. The following is required for approval, prior to ordering product, fabrication, and installation. Submit complete and at one time. Isolated items will not be considered for approval, except by prior authorization. Rejected items and items requiring correction must be resubmitted at one time, except by prior authorization.
   b. Submittals shall be provided as complete electronic PDF files that include the following:
      1) A single collated file of the Bill of Materials for each system, listed in the order it appears in this specification, configured to print on standard 8-1/2” x 11” or 11” x 17” paper.
      2) A single collated file of cut sheets for equipment listed in this specification configured to print on standard 8-1/2” x 11” paper.
      3) A single collated file containing drawings configured to print as a full-size set at project standard sheet size.
      4) Control system touch panel layouts, as identified below.
      5) Digital signal processing layouts, as identified below.
   c. The diagrams and details included with these specifications, modified to reflect the stated requirements and to reflect the details of the system as awarded, and including additional required information, may be used in preparing shop drawings. Drawings that are submitted without the necessary modifications will be rejected.

2. Bill of Materials and Catalog Data Sheets:

AUDIOVISUAL SYSTEMS
274100-6
a. Bill of Materials and Catalog Data Sheets of manufactured items.
b. At the end of the Bill of Materials include Catalog Data Sheets (“cut” sheets) for product arranged in the order listed in the specifications and in the Bill of Materials.
c. Include a cover page identifying the project and submittal.

3. Paragraph number as it appears in this specification.
   a. Paragraph title as it appears in this specification.
   b. Manufacturer.
   c. Model number.
   d. Quantity.
   e. Comments (if needed).

4. Shop Drawings:
   a. Block diagrams: Provide block diagrams of proposed connections of equipment that indicate equipment types and model numbers.
   b. Room Layouts: Equipment/projection/control room/studios layout(s), and equipment rack and cabinet details.
   c. Video Projectors: Provide plan and section drawings verifying image width, lens-to-screen distances and mounting methods. Provide detailed drawings of custom-fabricated or stock mounts and hardware, as well as locations of auxiliary electronic devices, such as digital media receivers.
   d. Projection Screens: Provide elevation drawing for each projection screen showing floor, ceiling, and screen, with screen size and dimensions for extra drop and image height above the floor indicated.
   e. Flat Panel Displays: Provide drawings showing displays, display mounts, method of attaching mounts to structure, and locations of auxiliary electronic devices, such as digital media receivers.
   f. Cameras, Antenna, Monitors, and Control Panels: Provide drawings in plans and section the detail mount arrangements and orientation for video camera, video monitors, antenna and control panels.
   g. Loudspeaker arrays or clusters: Provide drawings showing arrangement of arrayed loudspeaker components, showing physical arrangement and orientation as well as structural support and nearby architectural components affecting the coverage provided by the arrayed loudspeakers. Provide drawings stamped by a certified structural engineer indicating review and approval of indicated structural supports.
   h. Audiovisual Control System and Digital Signal Processing:
      1) Detailed control panel layouts and control logic notes, prepared by the control system programmer:
         a) Provide diagrams indicating signal flow for review and approval by Owner and AV Consultant.
         b) Upon approval of the above by AV Consultant, and prior to beginning control system code development, provide color draft set of control system touch panel layout diagrams (Graphic User Interface) for review and approval by Owner and AV consultant, noting comments from prior review. Include text, buttons, colors, images, and backgrounds as well as page flips, sub-pages, and overall page logic flow.
         c) Upon approval of the above by AV Consultant, provide control system touch panel programming file for final review and approval by Owner and AV consultant, noting comments from prior review.
      2) Detailed layouts for digital signal processors:
D. Samples:
1. Finish for control panels, racks, cabinets, and loudspeaker grilles.

1.7 TEST REPORT SUBMITTALS

A. Test Reports
1. Upon completion of SYSTEM PERFORMANCE TESTS AND ADJUSTMENTS specified in PART 3 - EXECUTION, submit for approval in writing test results including numerical values for measurements.
2. Also submit written certification that the installation conforms to specifications, is complete and operable,
3. Confirm that the system is ready for FINAL ADJUSTMENTS AND ACCEPTANCE TESTS specified in PART 3 - EXECUTION.

1.8 AS-BUILT DRAWING AND OPERATION MANUAL SUBMISSIONS

A. Operation and Maintenance Data - Coordinate with Section 01700
1. Draft Copies: At time of FINAL ADJUSTMENTS AND ACCEPTANCE TESTS specified in PART 3 - EXECUTION, provide draft copies of specified diagrams, schedules, and manuals for inspection during demonstration and acceptance testing. Submit final copies of documents within 30 days of project acceptance date. Drawings shall be drawn using the current version of AutoCAD. For Contractor-prepared drawings, schedules and instructions provide (1) draft copy and (2) final copies in electronic format for inclusion in the specified Complete Instruction and Maintenance Manual.
2. Functional Diagrams: Simplified single line block diagram showing interconnection of major equipment components and functional relationships. Illustrate receptacles, patch panel jacks, attenuators, transformers, switches, and loudspeakers. Key each patch panel jack to the patch bay by row and jack number. Diagram shall not illustrate terminal or interconnection cable number designations. The Functional Diagram included with these specifications, modified to exclude details, transformer tap designations, etc., and to provide the information described above and as-built changes, is suitable for this purpose. Mount a copy of the functional diagram behind clear plastic adjacent to the equipment rack(s) to which it applies.
3. As-Built Diagrams:
   a. The intent of the diagrams is to provide sufficiently clear and complete information that a technician of average skill may efficiently troubleshoot and service the system, even if unfamiliar with the installation.
   b. Provide drawings showing terminal blocks, connectors, relays, switches, transformers, attenuators, equipment components, and wires. Label devices with manufacturer, model number, and reference number (e.g. "SW 15," "TB 6"); reference numbers shall be consistent across drawings with no repetitions. As a minimum, provide an expanded version of the functional diagrams with cables fanned out at termination points and labeling as specified above; provide additional drawings where system complexity does not permit complete information to be shown legibly on an individual sheet no larger than the project sheet size. Provide labels for cables continued onto another drawing, indicating termination device, terminal numbers, and drawing sheet on which the termination is shown.
   c. As-built drawings are to include full connection information for each termination of conductors within a cable, either on the drawing itself via cable.
breakouts or by designating the connection type and providing separate
details for each connection type.

d. Provide layout drawings of panels and other custom assemblies containing
switches, relays, terminal blocks, receptacles, etc., using reference numbers
to identify physical locations of devices or label devices with reference
numbers in a location visible while viewing cable terminations. On wiring
diagrams, label conductors within cables for insulation color or another
identifier. Label connectors, barrier strips, switches, relay sockets, etc., for
terminal number. If device does not provide terminal designations, provide
key diagram for reference.

4. Receptacle Location Plan: Plan of area showing locations and designations of
receptacles.

5. Building Plan: Plan drawing of the building indicating the areas covered by the
various zone volume controls.

6. Patch Panel Assignment Schedule: Mount a typed schedule of patch panel
assignments behind acrylic at the equipment racks.

7. Spare Parts List: List of consumable spare parts (projector lamps, air filters, etc.)
with part numbers.

8. Control Setting Schedule: Fully document the settings of non-user-adjustable
controls. This includes power amplifier gain controls, equalizer settings, etc.

9. Complete Instruction and Maintenance Manual: Prepare in the form of an
instructional manual for use by Owner's personnel. Provide one (1) draft copy and
two (2) final copies unless otherwise specified.

10. Original Owner and Maintenance Manuals provided from manufacturer or high-
quality color reproductions.

11. Drawings: Provide sequenced bound drawings in project standard size.

12. Content of Manuals:

a. Provide a table of contents arranged in systematic or
der. Identify each
product by product name and other identifying symbols as set forth in
Contract Documents.

b. Contractor, name of responsible principal, address and telephone number.

c. Certificate of Warranty for the system as well as copies of the manufacturer’s
warranty for each equipment item.

d. Service Contract. Include a preliminary schedule for the specified semi-annual
site visits.

e. Complete as-built diagram(s) for systems.

f. Functional Diagram(s).

g. Conduit & Plate Location Plan(s).

h. Patch Panel Assignment Schedule.

i. Building Plan(s).

j. Original copies, high-quality laser printer printouts of PDF files, or high-quality
photocopies of manufacturers' installation, operation, and service manuals,
including schematic diagrams for each equipment item.

k. Shop drawings of custom-fabricated items.

l. Control Setting Schedule.

m. Audiovisual Control System:

1) Color printouts of touch screens control panel graphic layouts, as
installed.

2) Listing of system brand, models and associated peripherals.

3) USB flash drive containing the master program for the system, the
touch screen display program (including macros), programming,
communication, or other project-specific software required for re-
programming, and a limited license agreement for the use and
modification of contractor-generated source code in connection with the
maintenance and modification of the system for which it was written.
n. Software for Programmable Devices: Where a computer has been used in programming system components, provide USB flash drive containing the software, instructions for making interconnections to the programmed devices for modifying the programming, and a limited license agreement for the use and modification of contractor-generated source code in connection with the maintenance and modification of the system for which it was written.

o. Applicable software and hardware licenses to be documented and original copies of the licensed provided to owner.

1.9 JOB CONDITIONS

A. Sequencing and Scheduling:
   1. Coordinate work with adjacent work of other trades to facilitate construction and prevent conflicts.
   2. Afford other trades reasonable opportunity for installation of work and for the storage of materials.
   3. Staff the job to keep pace with the other Trades.
   4. Abide by the decision of the Architect in case of conflict or interference by other trades.
   5. Refuse: Remove refuse from the job site to the satisfaction of the Architect and Owner.

B. Insurance on the work of this specialty trade shall be provided as specified in Section 00810.

1.10 WARRANTY

A. Warrant equipment to be free of faulty workmanship and defects, and from damage due to contamination by construction dust and debris for a minimum period of one year from date of final acceptance.

B. Warrant repairs to "existing" equipment for a period of 90 days.

C. Paint and exterior finishes, fuses, lamps, and projection lamps excluded from above warranties except when damage or failure results from defective materials or workmanship covered by warranty.

D. The minimum warranty provisions specified above shall not diminish the terms of individual equipment manufacturers' warranties.

1.11 SERVICE CONTRACT

A. Provide a one-year service contract to commence after acceptance of installation without additional cost. Service to include two semi-annual visits to the site for routine adjustment and maintenance of equipment. Provide a preliminary schedule for the semiannual visits.

B. Toward the end of each year's Service Contract, provide the owner with a proposal for continued service during the next year.

1.12 TRAINING

A. The Owner may assign personnel to participate with the contractor during installation. Without delaying the work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

B. During tests and adjustments, permit the Owner's personnel to observe. When feasible explain the significance of each test.
1.13 **INSPECTION**

A. Notify the Architect of defects in work by other trades affecting installation.

**PART 2 - PRODUCTS**

2.1 **VIDEO ROUTING AND PROCESSING**

A. The functional diagram(s) connections shown on the bid documents are based on components manufactured by Crestron.

B. This manufacturer was used only as a reference to show the signal flow for the completed audiovisual system. The contractor must supply additional equipment required to provide a complete audiovisual system.

2.2 **VIDEO DISPLAYS**

A. Flat Panel Display
   1. Standard is Samsung
   2. General: refer to drawings

2.3 **VIDEO PROJECTION**

A. Video Projector
   1. Laser Lamp Source
   2. Acceptable Products:
      a. Refer to drawings

2.4 **RACKS, CARTS, FURNITURE, MOUNTS, AND SCREENS**

A. General:
   a. VERIFY RACK SIZES, TYPES, AND FINISHES WITH THE CONSTRUCTION MANAGER OR PROJECT MANAGER BEFORE ORDERING.
   b. VERIFY AND COORDINATE BLOCKING AND CLEARANCE REQUIREMENTS BEFORE ORDERING.
   c. Refer to drawings.

2.5 **CABLING**

A. The following tables list the cabling and connectors that have been approved for the project. Additional cables may be required. The contractor may submit cable part numbers, models, and product data for cable that is not listed in the table for approval by the consultant.

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model No.</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Microphone</td>
<td>22 AWG STP</td>
<td>West Penn</td>
<td>291</td>
<td>Equal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Belden</td>
<td>8761</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Liberty</td>
<td>22-2C-SH-GRY</td>
<td></td>
</tr>
<tr>
<td>Audiovisual System</td>
<td>AWG</td>
<td>STP</td>
<td>Supplier</td>
<td>Catalog Numbers</td>
</tr>
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<td>-------------------------------------------</td>
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<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>Microphone/Line Level (Plenum)</td>
<td>22</td>
<td>STP</td>
<td>West Penn Belden Liberty</td>
<td>25291 88761, 88761 22-2C-PSH-WHT</td>
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<tr>
<td>Line Level</td>
<td>20</td>
<td>STP</td>
<td>West Penn Belden Liberty</td>
<td>292 8762 20-2C-SH-GRY</td>
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<tr>
<td>Intercom</td>
<td>20</td>
<td>STP</td>
<td>West Penn Belden Liberty</td>
<td>292 8762 20-2C-SH-GRY</td>
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<tr>
<td>Speaker Low Z - Mains and Subwoofers</td>
<td>10</td>
<td>UTP</td>
<td>West Penn Belden Liberty</td>
<td>HA210</td>
</tr>
<tr>
<td>Speaker Mains</td>
<td>12</td>
<td>UTP</td>
<td>West Penn Belden Liberty</td>
<td>227 8477 10-2C-GRY</td>
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<td>Speaker Mains (Plenum)</td>
<td>12</td>
<td>UTP</td>
<td>West Penn Extron Liberty</td>
<td>25227 SPK-14 12-2C-P-WHT</td>
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<td>Speaker General Purpose</td>
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<td>West Penn Belden Liberty</td>
<td>226 8473 14-2C-GRY</td>
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<td>UTP</td>
<td>West Penn Extron Liberty</td>
<td>25226 SPK-14 Plenum 14-2C-P-WHT</td>
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<td>UTP</td>
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<td>225 8471 16-2C-GRY</td>
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<td>UTP</td>
<td>West Penn Extron Liberty</td>
<td>25225 SPK-16 Plenum 16-2C-P-WHT</td>
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<td>UTP</td>
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<td>224 8461 18-2C-GRY</td>
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<td>Speaker General Purpose (Plenum)</td>
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<td>UTP</td>
<td>West Penn Extron Liberty</td>
<td>25224 SPK-18 Plenum 18-2C-P-WHT 89740</td>
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<td>Video</td>
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<td>Hybrid Broadcast</td>
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<td></td>
<td>Gepco Belden</td>
<td>HDC920 7804Ex</td>
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<td>Precision Video</td>
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<td></td>
<td>West Penn Belden Alpha</td>
<td>6350 1694A 6458</td>
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<td></td>
<td>West Penn Belden Alpha</td>
<td>819 8241 9102</td>
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<tr>
<td>Video In Rack</td>
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<td></td>
<td>West Penn Belden Alpha</td>
<td>819 8241 9102</td>
</tr>
<tr>
<td>CATV Trunk Lines</td>
<td>75 Ohm Coax RG-11/U</td>
<td>West Penn Liberty</td>
<td>821 9064</td>
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<tr>
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<td>West Penn Liberty</td>
<td>25821</td>
<td>Equal</td>
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<tr>
<td>Control and Data</td>
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<tr>
<td>ALS Antenna</td>
<td>50 Ohm Coax RG-8U</td>
<td>West Penn Liberty</td>
<td>810 7733A</td>
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<td>Category 5e</td>
<td>23 AWG UTP</td>
<td>West Penn Liberty</td>
<td>4245</td>
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<td>Category 6</td>
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<td>4246</td>
<td>Equal</td>
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<tr>
<td>Category 6 (Plenum)</td>
<td>24 AWG UTP</td>
<td>Belden Liberty</td>
<td>DataTwist 7882A</td>
<td>Equal</td>
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<td>RS232/422</td>
<td>24 AWG STP</td>
<td>West Penn Liberty</td>
<td>D2404 9925 Series</td>
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<tr>
<td>Crestnet/AXLink</td>
<td>2-18 AWG UTP with 2-22 AWG STP</td>
<td>West Penn Liberty</td>
<td>77350</td>
<td>Equal</td>
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<tr>
<td>Crestron/AXLINK (Plenum)</td>
<td>2-18 AWG UTP with 2-22 AWG STP</td>
<td>West Penn Liberty</td>
<td>CRESNET-NP</td>
<td>Equal</td>
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<td>OM3 Fiber Optic</td>
<td>OM3 Type 50/125um x 4 Multimode Fiber</td>
<td>Panduit General Cable Extron</td>
<td>CRESFIBER8G-NP</td>
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<td>OM4 Fiber Optic</td>
<td>OM4 Type 50/125um x2 Multimode Fiber</td>
<td>Panduit General Cable Extron</td>
<td>OM4 MM P</td>
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<td>Interface Cables</td>
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<tr>
<td>HDMI Interface Cable</td>
<td>High-speed Category 2 HDMI Cable w/locking connectors</td>
<td>Crestron Perfect Path Legrand</td>
<td>CBL-HD-LOCK 700 Series</td>
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<td>DVI Interface Cable</td>
<td>Dual Link DVI-D</td>
<td>Crestron Perfect Path Legrand</td>
<td>CBL-DVI</td>
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</tbody>
</table>

2.6 APPROVED CONNECTORS

A. Connectors listed below are suggested for use with the specified cabling. Additional connectors may be required to complete the installation of the systems. If a different cable is submitted for approval by the consultant, provide the appropriate connector for the cable as part of the cable submission.
<table>
<thead>
<tr>
<th>Audio</th>
<th>Mic/Line/Intercom</th>
<th>XLR Male Panel Mount</th>
<th>Neutrik Switchcraft</th>
<th>NC3MX A3M</th>
<th>Equal</th>
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<tbody>
<tr>
<td>Mic/Line/Intercom</td>
<td>XLR Female Panel Mount</td>
<td>Neutrik Switchcraft</td>
<td>NC3FD D3F</td>
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<td>Combo Line</td>
<td>XLR plus ½” Phone Panel Mount</td>
<td>Neutrik</td>
<td>NCJ5FI-S</td>
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<td>XLR Male Inline Cable</td>
<td>Neutrik Switchcraft</td>
<td>NC3MD A3M</td>
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<td>Mic/Line/Intercom</td>
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<td>Neutrik Switchcraft</td>
<td>NC3FD A3F</td>
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<td>Mic/Line/Intercom</td>
<td>12 Pair Female Panel Mount</td>
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<td>Whirlwind W1CM</td>
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<tr>
<td>Mic/Line/Intercom</td>
<td>12 Pair Male Inline Cable</td>
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<td>Whirlwind W1IM</td>
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<td>Mic Broadcast</td>
<td>DT-12 Male Inline Cable</td>
<td>Whirlwind DT12IM</td>
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<td>Mic Broadcast</td>
<td>DT-12 Female Panel Mount</td>
<td>Whirlwind DT12CF</td>
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<td>4-Pole Panel Mount</td>
<td>Neutrik NL4MP</td>
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<td>8-Pole Panel Mount</td>
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<td>Neutrik NL4FC</td>
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<td>Speaker</td>
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<td>Neutrik NL8FC</td>
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<tr>
<td>Video</td>
<td>Hybrid Broadcast</td>
<td>Hybrid Panel Mount Male</td>
<td>Lemo</td>
<td>FMW.3K.93C.TLMC96Z</td>
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<td>Hybrid Panel Mount Female</td>
<td>Lemo</td>
<td>PEW.3K.93C.TLCC96Z</td>
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<td>75 Ohm Panel Mount</td>
<td>Neutrik Trompeter Kings</td>
<td>NBB75DFG UBJ28 KC-99-54</td>
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<td>Precision Video</td>
<td>75 Ohm Inline Cable RG-6</td>
<td>Neutrik Trompeter Kings</td>
<td>NBNC75BTU11 UPL2000 Series 2065-10-9</td>
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<td>75 Ohm Inline Cable RG-59</td>
<td>Neutrik Trompeter Kings</td>
<td>NBNC75BLP9 UPL-220-014 or -023 2025-51-9 or 2025-53-9</td>
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<td>Recessed Video Receptacle</td>
<td>75 Ohm Pass-Thru</td>
<td>Canare BCJ-JRU</td>
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<tr>
<td>Control and Data</td>
<td>50 Ohm ALS Ant.</td>
<td>50 Ohm BNC Cable Mount</td>
<td>West Penn CN-BM53-13</td>
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<td>Control and Data</td>
<td>Ruggedized RJ-45 Cat 5 Receptacle</td>
<td>Ruggedized RJ-45 Panel Mount</td>
<td>Neutrik NE8FDV-YK-B</td>
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<td>Control and Data</td>
<td>Ruggedized RJ-45 Cat 5 Connector</td>
<td>Ruggedized RJ-45 Inline Cable</td>
<td>Neutrik NE8MC-1</td>
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<td></td>
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</tbody>
</table>
### PART 3 - EXECUTION

#### 3.1 GENERAL

1. Equipment is to be installed by competent workers at locations shown on the drawings in strict accordance with approved shop drawings and manufacturer's instructions.

2. Equipment is to be fixed in place, except for portable equipment. This shall include loudspeakers, enclosures, amplifiers, cables, etc. Fastenings and supports adequate to support their loads with a safety factor of five, unless otherwise stated.

3. Take such precautions as necessary to prevent and guard against electro-magnetic and electro-static hum and to install the equipment to provide safety for the operator.

4. Protect equipment, including patch panels, connectors, receptacles, racks, consoles, and video projectors, from construction dust and debris until final acceptance of the system.

#### 3.2 SYSTEM DEMONSTRATION AND CHECKOUT (COMMISSIONING)

A. System installation will be certified complete and in fully adjusted working order by contractor. Fill in and submit the AVIXA 10:2013 Audiovisual Systems Performance Verification Checklist form prior to scheduling formal commissioning.

B. Fully Adjusted Working Order requires a system to be functional, set for normal operating conditions, and ready to be demonstrated to the AV consultant and end users for training and operation. This includes: termination of field and internal equipment rack cabling, cable labels, equipment labeling, installation of control system code, testing of devices under
touch panel or button panel control, remote control panels, external control sensors, IP and network settings, image adjustments, audio mixing, level and equalization adjustments, assistive listening tests, and external sub-system device control. Fully demonstrate spares supplied under the contract; including auxiliary interconnecting cables and accessories.

C. Confirm test results and data obtained and submitted for review during final commissioning, as requested.

D. Provide as-built drawings, manuals, and configuration software available to consultant during the final testing and commissioning. System Demonstration and Testing does not define the entire scope of proof of performance of the AV systems. Detailed performance requirements are listed in Section below.

3.3 LABELS:

A. Except where otherwise specified, label as shown on drawings and as specified each item of rack-mounted equipment, switches, controls, and receptacles.
   1. Connector and Rack Panels:
      a. Minimum 1/8” plate thickness.
   2. Rack-Mounted Equipment:
      a. Labels constructed of engraved and filled plastic laminate engraving stock.
      b. Designate function and input and output line(s) or loudspeaker(s) served by labeled equipment.
      c. Key designations to system functional and patch panel diagrams.
      d. Where possible, mount labels on blank panel directly above corresponding component.
   3. For modular equipment, provide label on inside of mainframe door identifying type of module for each slot (unless there is only one type) and gain setting as established at final checkout.
   4. Rack Identification Panel:
      a. Install panel with 1/8”-high engraved characters on the front of the bank of equipment racks serving each space. Clearly identify the Project, System Installation Contractor, Architect, and System Designer in the following format:

         PROJECT: Owner’s Name
                    Address
                    Room or spaces served
                    Owner’s technical support telephone

         SYSTEM DESIGNER: E3i Engineers
                          137a Lewis Wharf
                          Boston, MA  02110
                          (617) 530-1104

         SYSTEM INSTALLER: Company Name
                            Address
                            Telephone

         PROJECT ARCHITECT: Company Name
                              Address

   5. Receptacles:
      a. Engrave and fill receptacle label directly on mounting plate as indicated on Contract Drawings.
B. Identify wires and cables at every termination and connection point with the specified cable markers. The contractor is strongly encouraged to use a numbering scheme that identifies cables terminating at patch panel jacks with the patch bay row and jack designation; use A, B, and C suffixes to distinguish multiple cables terminating at the same jack.

C. Identify switches, relays, terminal blocks, etc., with reference numbers keyed to the as-built wiring diagrams.

D. Room numbers appear on the contract documents for reference only. Labels shall reflect the Owner’s final room designations.

E. Labels and legends shall be as approved on shop drawings.

F. Cable Markers:
   1. High-grade PVC clip-on or permanent-type cable markers with permanent markings, or printed vinyl tape protected by clear shrink tubing or adhesive wrap.
   2. Acceptable Products:
      a. Wieland Electrovert Type C or Z.
      b. Brady B-702 with Alpha FIT-221 series clear tubing.
      c. Brady BMP21-PLUS.
      d. Dymo RHINO 6000.

3.4 MICROPHONE EQUIPMENT

A. General:

B. Excluding wireless microphones, each portable microphone provided with case, stand adapter, and min. 15 ft. cable with attached XLR-type connector.

C. Condenser Gooseneck Microphone:
   1. Permanently mount to lectern.
   2. Locate to provide typical 6" to 18" working distance between microphone and lecturer's mouth.

D. FM Wireless Microphone System:
   1. Orient antennas as recommended by manufacturer. Locate in positions shown on drawings.
   2. Antenna Cables: Use specified low-loss 6/U (75 ohm) or 8/U (50 ohm) cable impedance.
   3. Except for transmitter equipment, equipment including preamps and active combiners requiring DC power provided with power supplies or powered by receivers (battery operation is not acceptable).
   4. Do not mount antennas or attached preamplifiers directly to metal structures. Mount at least 3 ft. from large metal objects.
   5. Dual-Antenna Phase/Diversity System (Telex, Shure, Sennheiser): Use 2 antennas, both vertically oriented, observe manufacturer's minimum required spacing.

E. Digital Wireless Microphone System:
   1. Install remote antennas min. ½ wavelength in distance from each other (UHF frequencies).
   2. Antenna Cables: Use specified low-loss 6/U (75 ohm) or 8/U (50 ohm) cable impedance.
   3. For systems with Digital Transceivers (access point), mount with face aimed at desired coverage area.
   4. Do not obstruct the microphone/transceiver line of site.
   5. Observe minimum separation between mounted access point/transceivers.
   6. Use RF spectrum scanning utility where required for RFI (Radio Frequency Interference) conflicts.
3.5 ASSISTIVE LISTENING SYSTEM (IF REQUIRED)

1. RF Assistive Listening System:
   a. Orient external coaxial dipole antenna ground plane in proper direction.
   b. Test receivers with program material for noticeable dropouts in signal.
   c. Test bodypack receiver accessory headphones and neck loops.
   d. Provide field strength data and commissioning report to AV consultant.

2. Loop Current Assistive Listening System:
   a. Coordinate the initial site survey for magnetic interference (background noise) with the loop system designer or manufacturer. Use manufacturer supplied test kit for loop current measurements.
   b. Adjust loop transmitters and antenna systems to meet IEC60118-4:2006 induction loop standards including; field strength 400mA/m, frequency response 100-5000Hz ±3dB relative 1000Hz, and background noise 47dB S/N ratio.
   c. Install flat under-carpet cable with specified warning tape to alert carpet installers and others to presence of loop wiring.
   d. Test loop receivers and accessory headsets using approved field strength meter.

3.6 CONTROL EQUIPMENT

A. Audiovisual Control System:
   1. Do not mount wireless receiver gateways or antennas near large metal objects.
   2. Carefully coordinate with manufacturer and with Architect the dimensions and mounting conditions.
   3. Provide cable, relays, and miscellaneous hardware to interface the audiovisual control system with controlled equipment.
   4. Install components to use the maximum amount of tally signals provided by the controlled equipment, including lighting dimmer systems and video playback and recording devices.
   5. Mount infrared LED emitter probes to face of controlled equipment using thin layer of clear silicone caulk. Position probe to provide control of device while continuing to allow use of infrared control supplied with equipment. Secure probe cables to prevent probe from being accidentally pulled from equipment during normal system operation.

B. Ethernet/IP/Local Area Network Accessibility and Control:
   1. Coordinate Ethernet connectivity and IP addressing of control devices with Electrical Contractor and the Communications/Technology management of the facility. Owner will provide IP addresses to AV contractor.
   2. Provide owner with remote control and management software interfacing via Local Area Network access from PC to IP addressed control devices.
   3. Coordinate with end-user and Communication/Technology management of the facility on POP-3 email notification of system service issues where desired and/or where possible. Co-ordinate with Owner and Communications/Technology management of the facility on POP-3 email of service or security issues in case of failure or disconnection of bi-directional (e.g. RS-232 or CRESNET/AXLINK) device.
   4. Verify requirements of system control via IP with or Owner and Consultant.

C. Local Area Network Management Programming:
   1. General:
      a. Verify requirements of room management/scheduling via IP with or Owner and Consultant.
   2. Room AV system control:
      a. Use included software and Ethernet connectivity hardware of control systems.
b. Program remote site portal to replicate appearance and function of control touch panel.
c. Control program can be launched locally from designated AV technician computers as stand-alone “.exe” Windows-based executable file.

3. Remote System Status Monitoring and Management Programming:
   a. Use included software and Ethernet connectivity hardware of control systems.
   b. Provide system-wide and room-specific monitoring and management including:
      1) Room activity and system shut-down scheduling.
      2) Multiple user level password settings, including password change and lock-out of certain user passwords at certain times.

D. POP-3 Email Notification Programming and Set-up:
   1. Via included software and Ethernet connectivity hardware of control systems.
      a. Provide service issue notification via pre-programmed email messages to designated service accounts ONLY if requested by end-user AV support technicians and ONLY if control system includes POP-3 mail server.
      b. Coordinate with AV Consultant and Owner to determine proper conditions and destinations for email service.
      c. Provide notification of AV system service issues.

E. Audiovisual Control System Programming:
   1. Programming is to be performed by a programmer that is certified by the manufacturer of the AV control system equipment provided.
   2. Program system or instruct AV Control System Manufacturer to program system as instructed by the AV Consultant and the Owner, and as indicated on the drawings so that devices are controlled in a logical manner, and to take full benefit of the capabilities of the Control System.
   3. Changes to programming or control panels required by actual conditions (e.g. number of dimming system presets).
   4. Refine and adjust the control programming to operate in a logical and consistent fashion. Revise program as directed by the AV Consultant at checkout to correct operational inconsistencies or to properly control devices.
   5. Ascertain that the system is optimally programmed for smooth transitions between media uses and for minimal wear-and-tear on equipment and audiovisual media.
   6. Verify that video playback device transports are stopped when another input source is selected, unless playback device is routed to a different destination from the selected source.
   7. Wherever possible, utilize status feedback of source equipment, dimming systems to indicate to the control system and user the actual operating mode of the equipment. When feedback is not available (e.g. consumer playback equipment) program control system to issue commands to minimize status reporting errors.
   8. Distinguish between primary and secondary control buttons by intensity or color. If available, use “3D” buttons to indicate button activation as visually “depressed”. Avoid excessive use of primary or other bold colors.

F. Color Video Touch-Screen Control Panels:
   1. Submit panel graphics including text, buttons, colors, images, backgrounds, as well as panel flips, sub-panels and overall screen logic flow to the Owner and Consultant for review and approval.
   2. Use Crestron Studio or AMX TP Design for panel logic programming and design; make software files available directly to the end user upon request, free of charge.
   3. Adjustments, revisions, modifications to the panel graphics and control system required for complete operation are the responsibility of the installing contractor.

G. Master and Portable Control Panels:
   1. Install local control panels in associated backboxes.
2. Verify size and mounting conditions with Architect.

H. Control System Functions:
1. Following are general descriptions and guidelines for control system panel functions and layouts:
   a. Turn system power on/off.
   b. Input Source selection.
   c. Separate speech and program audio volume controls. Set microphone and audio playback levels to a minimum operating level upon startup.
   d. Recovery from power outage.
   e. Control digital signal processors to provide system presets indicated in this specification or on the AV drawings.
   f. AC power failure and switchover to UPS.
   g. Others as identified elsewhere in the Contract Documents.
   h. After system shut-down, system will restart with default settings restored.

2. Following are specific descriptions and guidelines for control system panel functions and layouts:
   a. Volume Control (provide separate microphone and program audio volume controls where applicable).
   b. Projection screen up/down.
   c. Transport controls for applicable AV sources.
   d. Select which video input is actively displaying and playing audio through the AV system.
   e. Others as identified elsewhere in the Contract Documents or required.

3. Where applicable, configure the audiovisual control system(s) with the following operation(s):
   a. Control system shall communicate with video display devices (particularly video projectors) during start-up and shut-down. Feedback shall be provided on the control panel indicating when the projector is cooling down and inform the user that the projector cannot be restarted until cool-down is complete.
   b. Control system, audio signal processors, and digital video switch equipment will connect to the UPS where these devices are specified. Control system shall communicate with UPS device. In the event of a power outage, after one minute has passed, control system shall instruct the other UPS-connected devices to shut-down properly to protect their programming. After power is restored, user will be required to restart system from control panel.

4. Interface with Fire Alarm System: The audiovisual system shall connect to the FAS as identified on the drawings or as required by the local AHJ. Systems shall be muted when triggered by the FAS.

3.7 NETWORKED AV & SECURITY

A. Prevent unauthorized users from access to the systems and network and prevent disclosure of confidential information.

B. Passwords of internet connected audiovisual equipment are readily known and can be used as a means to access network equipment by unauthorized users. AV networked devices may include devices with a wireless or wired Ethernet port.
1. Assign role based access control with different levels of access and permissions for each user type:
   a. Admin – Ability to make changes to network, security configurations, and user accounts.
   b. AV Configuration – Ability to make changes to AV Parameters.
   c. System User – System operation only.
2. Change passwords from default values to project specific passwords. Follow
industry recommended password strength standards when choosing new
passwords.
3. Provide new passwords to the owner.
4. Provide instructions to change passwords.
5. Confirm all network work with owner.

C. AV Network Switches:
1. Do not connect unauthorized AV network switches to the Owner’s LAN.
2. Provide logical separation of AV and IT networks through hardware and VLAN’s.
3. Disable unoccupied ports and services on managed switches.

3.8 AMPLIFIERS AND DIGITAL AUDIO SIGNAL PROCESSORS

A. Gain Control Security:
1. Amplifiers and Signal Processing Equipment: Power amplifiers and signal
processing equipment with front panel controls or power switches which are to be
permanently adjusted (not normally adjusted by the operator), such as equalizers,
distribution amplifiers, limiters, and audio delays, shall be furnished with lockout of
front-panel controls, security panels, or be mounted on subpanel behind blank
panels. Provide transparent plastic panels for viewing of indicators such as meters
or LED indicators.

B. Audio DSP and Surround Processing:
1. Install equipment to manufacturer’s specifications and industry standards.
2. Adjust the system gain and equalization to meet specifications. Adjust equalization
curves for speech and program audio playback.
3. Record and store DSP configuration files.
4. Test functions of each piece of audio DSP equipment, including front panel and
remote controlled functions.

3.9 LOUDSPEAKER EQUIPMENT

A. Loudspeaker Arrays:
1. Carefully inspect the site to verify that no obstructions, such as beams, panels, or
large framing members exist between high-frequency horns and the seating area
covered by the horns. Immediately notify Architect of obstructions.
2. Provide and install safety cable to secure loudspeaker components and mountings.
3. Provide structure and framework to properly support the loudspeakers in the
indicated locations.
   a. Provide shop drawings of proposed structure for review prior to fabrication.
   b. Obtain the stamp of a structural engineer registered in the same state as the
construction site on shop drawings which depict loudspeaker cluster structure,
framework and support system(s).
4. Paint components and provide cloth grilles for loudspeaker enclosures per
Architect’s direction.

B. Ceiling-Mounted Loudspeaker Enclosures and Grilles:
1. Ceiling Enclosures:
   a. Enclosures shall be supported directly from ceiling structure in an approved
manner.
   b. Support to acoustical ceiling tile is NOT ACCEPTABLE.
2. Flush and Surface-Mounted Ceiling Enclosures:
   a. Provide enclosures where indicated on drawings.
3. Surface-Mounted Wall Enclosure:
   a. Located as indicated on drawings.
   b. Coordinate enclosure colors with the Architect.
3.10 VIDEO EQUIPMENT

A. Video Projectors:
   1. Verifications:
      a. Verify lens selection, locations, and elevations shown on drawings using manufacturer's throw distance and elevation formulas for specified projector model.
      b. Submittals:
         1) Provide plan and section drawings verifying image size and format, lens-to-screen distances and mounting methods.
         2) Provide detailed drawings of custom-fabricated or stock mounts and hardware.
         3) Provide detailed drawings of millwork or finish items required for specified screen dimensions.
         4) Where mirrors are required, provide detailed drawings of mounting angles, reflection rays, support structures and hardware.
         5) Where projector mounts or motorized lifts are installed by others, provide drawings to guide installer indicating installation positions allowing optimal projector performance.
   2. Mounting:
      a. Install projector mount and suspend projector at location and elevation indicated on approved shop drawings.
      b. Projector mounts and motorized lifts must meet local safety and code requirements for ceiling mounted equipment.
      c. Fixed projector mounts must be rigid and completely free of sway or rotation deviation.
      d. Projector support pipes shall be only fixed-length pipes.
      e. For ceiling-mounted installations where screen surfaces are vertical, level projector at 0° front-to-back and side-to-side.
      f. Position projector with lens centered on screen centerline in plan unless projector is provided with horizontal lens shift capability. Do not employ vertical or horizontal electronic keystone correction unless specifically authorized to do so.
      g. Minimize hardware and cables visible from audience seating and presenter’s view.
      h. Paint exposed mounting hardware to match room interior or as instructed by Architect.
      i. Where structural mounts or millwork openings are provided by others, verify correct positioning and dimensions before mounting projector. Provide written notification to the Owner or Architect of discrepancies in mounting positioning or stability deficiencies before projector installation.
      j. Where rear projection screen millwork is provided by others, provide written notification to the Owner or Architect of discrepancies in opening dimensions before screen or projector installation.
      k. Provide projector brackets, fittings, pipes, miscellaneous hardware and wireways.
      l. Run cabling from video projector box to projector within projector support pipe.
      m. Provide approved security cable for video projectors to accept padlock provided by owner.
      n. Confirm that the lift and or projector is isolated from building or external vibrations.
      o. When using an external box for projector components make sure the box is adequately ventilated and has enough AC power receptacles.
p. Confirm that the projector fan noise is within the manufacturer’s specification.

B. Video Display Panels:
   1. Submittals:
      a. Provide elevation drawings showing location of video displays for approval. Where display is part of a larger graphic display, verify exact location of display with Architect.
   2. Mounting:
      a. Install display mount and display at location and elevation indicated on approved shop drawings.
      b. For wall–mounted displays, provide mount to support display from blocking, if provided, or from wall studs. If a recessed box is provided behind display for power outlets and electronic accessories, provide mount that does not obstruct access to box.
      c. Wherever possible, minimize hardware and cables visible from audience seating and presenter area view points.
      d. Where display is mounted in an architectural recess, verify that sufficient clearance (2” minimum) is provided for ventilation airflow.
      e. Provide display mounts with security provisions to accept owner-provided padlocks.

C. Digital Media Transmission and Switching Systems:
   1. Extended Display Identification Data (EDID):
      a. Do not operate digital media transmission/switching equipment in “automatic EDID” mode, unless equipment provided has no other option.
      b. Do not include resolutions in the EDID table that cannot be handled by display(s).
      c. For systems where laptop computers will be used in “mirroring” mode, ensure that as many possible common resolutions are included in the EDID table without violating provision of preceding paragraph.
      d. For inputs where the source is a fixed device (i.e. a fixed part of the system) create the EDID table with a single entry, again without violating provision of preceding paragraph but one.
   2. HDCP Implementation:
      a. For systems containing a non-HDCP-compliant display device, such as a class capture appliance or videoconference CODEC, and where switching equipment supports the capability, dynamically configure input devices for portable equipment such as laptops to report to the equipment as non-HDCP devices when the non-compliant device is in use.

D. USB Video Transmission and Cameras:
   1. Extension cabling for USB 3.0,3.1:
      a. Use active extension cabling with power to transmit uncompressed (5 Gbps) UVC standard video.
      b. For USB cameras powered by PoE+, observe IEEE 802.3at for power and cable distance.
      c. External camera power supplies shall be installed in a plenum enclosure when the camera is ceiling mounted.
      d. Test pan/tilt fully for clearance from obstructions.

3.11 PROJECTION SCREENS

   A. General:
      1. Install projection screens at locations indicated to comply with screen manufacturer’s written instructions.
      2. Install front-projection screens with screen cases in position and relationship to adjoining construction indicated. Securely anchor to supporting substrate in a
manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
3. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.

3.12 RACKS, CABLES, CONNECTORS, AND MISCELLANEOUS EQUIPMENT

A. Wiring and Interconnections:
1. Exercise care in wiring to avoid damage to cables and equipment.
2. Make joints and connections with rosin-core solder or approved mechanical connectors, except mechanical connectors are NOT acceptable on microphone lines. Connections to transformer leads for distributed loudspeakers may be made using properly-sized wire nuts or nylon-insulated pigtail crimp connectors such as Waldom CE series. Wire nuts are not acceptable except at individual loudspeakers.
3. Connections to screw-type terminals shall be made using spade lugs. Bare or tinned wire is not acceptable.
4. Connections to lugless compression-type screw terminals shall be made using bare wire only. Do not tin wire.
5. Wiring executed in strict adherence to standard broadcast practices. This includes:
   a. Dress cables in conveniently sized bundles, combed into parallel runs, either laced or banded.
   b. For equipment mounted on glides, or otherwise requiring servicing from the front of the rack incorporate a cable "service loop" to permit the equipment to be pulled forward from the rack for servicing.
   c. Support cables and bundles to ensure that no strain is placed on connections or connectors.
   d. Organize cables and cable bundles behind patch bays to permit easy access to the patch panels to add or remove cables.
   e. Place cable markers 3"-5" back from video connectors to permit easy viewing. Do not bind markers into cable bundles.
6. Grounding:
   a. Ground equipment, racks, and audio line shields to independent audio system ground ONLY as shown on drawings. If not shown on drawings, ground case of power strip lines in equipment racks to the racks and directly to isolated ground buss in the power panel or to power system ground at the building AC service entry only.
   b. Ground conduits ONLY to power system ground.
   c. Insulate conduits and electrical boxes from sound system, including equipment racks and audio system ground.
   d. Insulate conductors in conduit, including shields, from the conduit, back boxes, and from each other for the entire conduit length.

B. Equipment Racks:
1. Install equipment in racks to permit access to equipment for service. Transformers, relays, terminal blocks, etc., mounted in rear of racks behind other equipment shall not prevent access to equipment connections or shall be mounted on hinged panels to permit access.
2. Wire equipment racks in the AV Contractor's shop.
3. Install equipment in racks with ventilating panels to provide adequate ventilation and according to equipment manufacturer's recommendations.
4. Provide unused panel space with blank or ventilating panels.
5. Locate free-standing racks as indicated and to provide access to rear without moving racks.
6. For permanently located racks containing equipment on glides, with desk/control surfaces, or which may be unsteady from cantilevered devices or personnel, bolt racks to the concrete floor slab (through the access flooring if necessary).
7. Bolt adjacent racks together in at least 3 locations along both the front and rear edges.
8. Install "Anti-tip" bases, casters and brakes for equip racks that are not bolted to the floor because of service access.

C. Wall-Mount Equipment Racks:
   1. Drywall Partitions:
      a. Before installation of drywall material, install blocking or other bracing required to support weight of equipment rack.
      b. If internal wall bracing is not provided before wall is closed in, install ¾” plywood mounting plate secured with drywall screws to at least three separate studs.
      c. Size the plate and number of mounting screws to support weight of rack plus safety factor.
      d. Paint plywood to match wall finish.
      e. Strut channel hardware support frame attached to structure is also acceptable.

D. Audio Patch Panels:
   1. Normalled pairs of jacks to be located vertically adjacent except as indicated.
   2. Locate output jacks in top row and input jacks in bottom row except as indicated.
   3. Locate patch panels at least 30” above floor.

E. Patch Cord Holders:
   1. Provide 1 patch cord holder for every 24 patch cords. Mount to wall or side of rack near the patch panel.

F. Conduit:
   1. Run lines in metallic conduit or wireways unless otherwise indicated. Run microphone level, line level, loudspeaker level, and DC control wiring each in separate conduit.
   2. Do not locate AC power lines in conduit containing network, audio or video lines.
   3. Do not splice lines in conduit.

G. Exposed Cables:
   1. Line level or mic level lines exposed above countertops (such as those lines serving mixing consoles, program source equipment) shall be rubber-jacketed, AWG #20 two conductor with braided shield such as Belden 8412 or equivalent. Plastic or vinyl jacketed cables are not acceptable.

H. Receptacles:
   1. Wall-mounted receptacles installed in metal boxes at building standard receptacle height unless otherwise indicated.
   2. Floor-mounted receptacles installed in flush floor boxes with flush lids.
   3. Catwalk-mounted receptacles in metal boxes mounted on catwalk hangers at building standard receptacle height.
   4. Balanced Receptacles:
      a. Attach "XLR" type connectors to mounting plates with machine screws unless using single-hole mounting types with threaded sleeve and mounting index to prevent rotation.
   5. Unbalanced Receptacles:
      a. Install 1/4" phone jacks to mounting plates with insulating washer and sleeve to electrically isolate the jack from the electrical box and conduit.
      b. Install isolation/balancing transformers in electrical boxes or wireways adjacent to each unbalanced receptacle as indicated.
      c. Wire input receptacles to short the line except with connector inserted.
   6. Video Receptacles:
a. Install feed-through BNC receptacles to mounting plates with insulating washer and sleeve to electrically isolate the receptacle from the electrical box and conduit.

I. Loudspeaker Wiring:
   1. Note that Functional Diagrams or Conduit Drawings indicate required home runs for loudspeakers and loudspeaker zones. Home run requirements depend on line power loss as well as functional considerations and shall be strictly adhered to.
   2. Loudspeaker lines above ceilings installed using specified UL listed plenum-rated cable. Lines installed as high as possible, directly to undersides of floor or to roof decks above, using strain reliefs, cable ties, or other approved method to attach lines securely and neatly to building structure. Lines installed loosely or otherwise on top of ceiling tiles, ductwork, is NOT ACCEPTABLE.

J. Floor-to-floor lines installed using specified UL listed plenum-rated cable. Attach lines securely and neatly to building structure using Owner-approved method.

K. Fiber Optic Cables:
   1. Terminate fiber optic strands with connectors compatible with connectors on equipment and with fiber optic cables provided.
   2. Use of compatible quick-connection system is recommended (e.g. Corning UniCam® Pretium Installation Tool Kit for Corning fiber cable; Belden FiberExpress System or West Penn Wire Fiber products with Optimax Installation Tool Kit).
   3. Neatly coil surplus fiber cable using bend radius larger than manufacturer’s minimum bend radius and secure to rack to prevent crimping or damage to cable or provide rack-mount fiber management.

3.13 SYSTEM PERFORMANCE TESTS AND ADJUSTMENTS

A. Test equipment to verify conformance with manufacturer's performance specifications and with this specification.
   1. Verify systems meet the requirements identified in this section or otherwise within the contract.
   2. Adjust systems to conform to testing requirements for failed tests.
   3. Provide results of final, recalibrated system testing to Architect and AV Consultant for review and approval prior to scheduling of commissioning testing by AV Consultant or user training provided to Owner.

B. Audio Systems:
   1. Absolute Impedance:
      a. Set loudspeaker level controls at zero attenuation. Measure absolute impedance value of each loudspeaker line at 250, 1000, and 4000 Hz, without amplifier connected but with loudspeakers connected. Impedance shall be at least 90% of rated load impedance of respective amplifier. Check resistance of lines to loudspeaker and microphone receptacles, with receptacles open and short circuited.
   2. Hum and Noise Level:
      a. Adjust gain controls for optimum signal-to-noise ratio and full amplifier output with -55 dBm level at a microphone input and 0 dBm at line-level input.
      b. Without changing gain, terminate microphone and line-level inputs with shielded resistors of 150 and 600 ohms, respectively.
      c. Measure overall hum and noise level at each power amplifier output for each input channel. Level shall be at least 80 dB below rated power output of amplifier over a bandwidth of 20-20,000 Hz.
   3. Electrical Distortion:
      a. Load power amplifiers with resistors matching nominal impedance of output terminals used in system in place of actual loudspeaker loads.
b. Adjust gain controls as for hum and noise level tests.
c. Apply 1000 Hz size-wave signal from an oscillator having less than 0.1% total harmonic distortion to each microphone and line-level input at level required to produce measured full amplifier output.
d. Distortion shall measure less than 0.1%.

4. Parasic Oscillation and RF Pickup:
   a. Set up system for each specified mode of operation.
   b. Use 50 - 100 MHz bandwidth oscilloscope and loudspeaker monitoring.
   c. Check to ensure that system is free of spurious oscillation and RF pickup in the absence of input signal and also with system driven momentarily to full output at 160 Hz.

5. Buzzes, Rattles, Distortion:
   a. Apply a high-quality music signal to the system. Adjust the loudness for frequent peaks at its specified maximum sound pressure level.
   b. Apply sine-wave sweep from 50-50,000 Hz at 6 dB below full amplifier power.
   c. In both cases, listen carefully for buzzes, rattles, and objectionable distortion.
   d. Correct causes of such defects. If cause is outside the system, promptly notify the Architect and his Consultant, indicating cause and suggested corrective procedures.

6. Level Balance: Adjust level controls for items of similar equipment for identical measured voltage gain.

7. Measure system acoustical performance using a sound level meter set for "slow" meter damping except as otherwise noted, and flat response with random incidence at a height of 4 to 5 feet. Interior finishes and furnishings shall be in place, and system gain shall be adjusted to provide levels of 70 to 80 dB and at least 10 dB above background noise at the measuring locations for these tests, except as otherwise noted. Include the following tests and adjustments:
   a. Frequency Response:
      1) Measure loudspeaker frequency response with control equalization set for flat response, using 1/3-octave bands of filtered pink noise centered on ANSI preferred frequencies, or broadband calibrated pink noise measured in 1/3-octave bands using a calibrated real-time analyzer.
      2) Adjust equalization to provide average system response within ± 3 dB of a response (0 dB) which is flat from 63-2500 Hz and slopes uniformly from 0 dB at 2500 Hz to -5 dB at 10,000 Hz.
   b. Uniformity of Coverage:
      1) Use 4000 Hz octave band of random noise as test signal output to loudspeakers.
      2) Lateral Uniformity: ± 2 dB at positions equidistant from front of hall.
      3) Front-to-Back Uniformity: Decreasing linearly within ± 2 dB from 0 dB at front of hall to -6 dB at rear as measured on the hall center line.
   c. Maximum Output Level:
      1) Measure with standard “fast” meter damping.
      2) Loudspeaker Cluster:
         a) Capable of providing 95 dB SPL in the audience area on axis of high-frequency horn and employing wideband recorded music as a test signal.
      3) Distributed Loudspeaker Systems:
         a) Capable of providing 85 dB SPL on axis of loudspeaker and using wideband recorded music as a test signal.
   d. Speaker Polarity:
      1) Test that speakers in the same zones have the same polarity.

C. Video Systems:

AUDIOVISUAL SYSTEMS
274100-27
1. Test the video system following the approved Proof-of-Performance Test Plan to verify that it meets these minimum performance requirements.

2. Video Standards:
   a. Frequency Response: ± 0.5 dB, 60 to 4.18 MHz
   b. Crosstalk: -40 dB at 3.58 MHz
   c. S/N Ratio: 45 dB, DC to 4.18 MHz, unweighted, peak to RMS
   d. Hum: <10 mV peak to peak
   e. Line and Field Tilt: 2% with 60 Hz square wave
   f. Differential Gain: 1% at 3.58 MHz, 0-90% APL
   g. Differential Phase: ± 1° at 3.58 MHz, 0-90% APL
   h. Envelope Delay: ± 0.1 microseconds, 0.2 to 2.1 MHz; ± 0.05 microseconds at 3.58 MHz
   i. Color Production: Primary and Complementary Colors (R, G, B, Cy, Yl, Mg) at 75% saturation within inner 50% of the inner boxes (± 2.5°) when viewed on a Vector Scope.
   j. Signal Levels: 1 V p-p, ±1 IRE, at 100% peak white color bar.

3. Audio Standards:
   a. Frequency Response: ±1 dB, 30-15,000 Hz
   b. Hum and Noise: -80 dBu, 30-15,000 Hz, unweighted
   c. Distortion: 0.25% THD, 30-15,000 Hz
   d. Signal Levels: +4 dBu

D. Video Display Systems:
1. Calibrate each video display system as follows:
   a. For projected displays align the image with the black borders of the screen:
      1) If the display uses a variety of aspect ratios use the zoom lens to align the image with the black borders of the screen.
      2) If the image does not fill the screen (e.g., a 16:9 screen with 4:3 image) then align top and bottom of image with black border of screen.
   b. Turn off video enhancement circuitry options including image overscan.
      a. Set factory color temperature to warm, D65, or other setting to achieve closest approximation to 6500°K color temperature. Set sharpness control to minimum.
      b. Adjust black level and video gain:
      c. Reduce ambient light to less than 2 foot-candles of ambient light on screen.
      d. Using the PLUGE (Picture Lineup Generating Equipment) pattern from the signal generator, adjust the brightness (brightness control on most displays) until the “blacker-than-black” bar is visible on the screen and then decrease brightness until the bar just disappears.
      e. Using the grayscale pattern from the signal generator, adjust the contrast control so that the highest grayscale transition disappears and then decrease contrast to make the transition just visible.
      f. Repeat steps b and c to obtain stable results. Record control settings.
   c. Adjust color level or gain:
      a. Display SMPTE color bar test pattern. Shut off red and green channels on display or use a blue filter to observe the display.
      b. Adjust color and tint controls for optimum blue balance.
      c. With only red channel operating or with red filter check red balance. Repeat for green channel. If red and/or green balance is significantly out of balance, make minor changes to color and tint controls to achieve best compromise for color control settings.
      d. Record control settings.
   d. Adjust sharpness:
      a. Using the S802B or similar pattern, adjust sharpness control for maximum sharpness without ringing (duplicate lines).
b. Record control setting.

5. Brightness, Uniformity, and Contrast Ratio:
   a. Using the ANSI 9-zone pattern and a spot photometer, measure screen brightness in each zone. Calculate screen brightness as the average of the nine zones and uniformity as the maximum variation from the average.
   b. For a projected image, use the ANSI 16-zone checkerboard test pattern and viewing locations measure the contrast ratio of representative white squares vs. adjacent black squares. Repeat contrast measurement with room lighting at representative viewing level (typically 7fc in seating area).
   c. Record measurements.
   d. For display systems employing identical equipment (same model number), measure and adjust two representative samples as specified above. If control settings for both displays are in close agreement, controls of remaining identical displays may be set to same values without further testing, unless resulting performance is visibly different from the first two.

E. Digital Video Systems:
   1. Provide the following information for systems employing HDMI and/or digital media signals:
      a. The video timing (e.g. 1080p 30 fps Deep Color or 1366x768 30 Hz), HDCP use, and audio format of each non-portable digital source when operating.
      b. The video timings and supported audio formats for each connected sink.
      c. The video timings and supported audio formats presented in the EDID of sinks to each source – indicate the preferred video timing.
      d. The length of cable used on HDMI or shielded twisted pair cables used for AV distribution.
      e. The data rate supported by each shielded twisted pair cable used for AV distribution.

F. Video Projectors:
   1. Provide written verification of completion of the above procedures.
   2. After completion of projector set-up, record the following items for inclusion in pre-acceptance test reports:
      a. Current lamp life hours shown on projector (include date).
      b. Provide security service code if required by owner.
      c. Set-up software version number.
      d. Projector, input modules, and decoder card serial numbers for each system.
      e. Date of manufacture.
      f. Date of installation.
      g. List of supplied accessories (remotes, lens caps, tools, cables, backup discs, owner’s manuals).

G. Remote Control Systems:
   1. Test each function of each control station or touch panel to verify proper operation and that each illuminated button and indicator operates properly when the associated function is selected.
   2. Test Reports and Certificates: Submit results of tests and adjustments conducted above and certification that the installation is complete and ready for checkout as specified under SUBMITTALS in PART 1 - GENERAL.

3.14 FINAL ADJUSTMENTS AND ACCEPTANCE TESTS

A. Upon approval of the contractor’s test report, and at a time set by the Architect, assist the Consultant(s) in performing final system adjustments and acceptance tests. Provide labor, material, tools, and measurement equipment necessary for these tests and adjustments, including the test equipment and material specified in Article 1.1, except as otherwise specified.
B. Supply representatives who are thoroughly familiar with details of the system to assist in the performance of these tests and include the field supervisor in charge during the course of the installation work.

C. Budget xx working hours for the performance of these tests and adjustments. If final acceptance is delayed beyond this period because of installation not in accordance with these specifications, pay for additional time and expenses of Consultant(s) during resultant extension of the acceptance testing period.

D. Acceptance tests may include speech intelligibility surveys and subjective evaluations by observers listening at various positions under various operating conditions, using speech, music, and live or recorded effects material.

E. Measurement of frequency response, distortion, noise, or other characteristics may be performed on items or groups of items deemed necessary to determine conformity with specifications.

F. Adjust the system as instructed by the Consultant. Adjustments may be required to the system including:
   1. High-frequency horn aiming.
   2. Equalization and level balance.
   3. Timing and functioning of the audiovisual control system.
   4. Video projector alignment, contrast, brightness, and color content.

END OF SECTION
SECTION 280000
ELECTRONIC SAFETY AND SECURITY

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:
      a. Access Control System
      b. Video Surveillance System

1.3 ACCESS CONTROL SYSTEM REQUIREMENTS
A. General
   1. This specification section describes the products and execution requirements relating to the furnishing, installation, testing, and commissioning of a complete Access Control System and placing it into satisfactory operation.
   2. This system is an extension of the existing DFCI Police and Security Access Control and CCTV Surveillance Systems.
   3. The existing DFCI Police and Security Access Control is Software House CCURE 9000. All new panels shall be configured as an extension of the existing system. All licensing shall be provided by this contractor for access control systems related to this project.
   4. In general, work consists of installation of new [and relocation of existing] access control field devices and all associated cabling as part of this project.
   5. Major features of the Access Control System and responsibilities to furnish and/or install equipment, install cabling, and terminate cabling are as follows:
      a. Division 08 contractor-furnished, Division 08 contractor-installed
         1) ADA Door Operators
         2) ADA Door Operator Pushbuttons
         3) Electric Latches and Strikes
         4) Push-bars with integrated request-to-exit switches
         5) Power-transfer Door Hinges
         6) Magnetic Locks
      b. Division 28 contractor-furnished, Division 28 contractor installed
         1) Cabling:
         2) ADA door operators to ADA door operator pushbuttons. Field Device to Controller (incl. signal and power)
         3) Cable Termination at Field Devices
         4) Credential Readers
         5) Door lock Power Supplies
         6) Request-to-Exit Devices (PIR)
         7) Control Panels (Controllers)
         8) Control Panel Enclosures
         9) Duress Buttons
B. Installation
1. Receive, store and install Access Control System equipment and cabling as specified.
2. Comply with the manufacturer’s instructions and recommendations for installation of all products.
3. Provide all system wiring between all components in accordance with manufacturer’s guidelines. Each cable for each device shall be home run. No splices are allowed unless otherwise noted.
4. Intermediate termination points within a wire run would be considered a splice. If intermediate termination points are allowed, with prior approval of the Agency and the Engineer, provide pull boxes and terminal strips permanently labeled with the numbering scheme per Agency’s requirements.
5. Mount all credential readers where shown on plans. Placement shall be in accordance with Americans with Disabilities Act (ADA) requirements.
6. Locate all request-to-exit motion detectors directly above the door frame, centered on the door opening (as applicable). Adjust sensitivity to permit operation on motion of persons within 2’-0” of door. Avoid false activation by persons passing by where possible.
7. Provide wiring to request-to-exit devices located in electrified door hardware.

C. Field Device Installation
1. Field devices are shown on the drawing locations diagrammatically and shall not be used for dimensioning of final location. The exact location of door control devices shall be determined by the Division 28 contractor and verified with the General and Division 08 contractors.
2. Multiple devices (i.e. intercoms, card readers, etc.) at door locations shall be mounted adjacent to each other.
3. Mount Credential Readers at 42” AFF to center unless noted otherwise on drawings.
4. Card reader stations shall not be mounted back-to-back on a common wall. Maintain separation to eliminate one card reader reading through the wall to a card reader on the opposite side.
5. The Division 26 contractor shall make all 120 volt connections to access control panels, and at remote and local door power supply locations as indicated on the drawings.

D. Door Control Interface Wiring
1. Obtain from the Division 08 contractor all necessary cut sheets, wiring diagrams, and manufacturer’s installation instructions.

1.4 VIDEO SURVEILLANCE SYSTEM REQUIREMENTS
A. General
1. This section covers the equipment, hardware and cabling requirements of a Video Surveillance System (VSS) for the project.
2. The existing DFCI Police and Security surveillance system is American Dynamics Video Edge. Cameras shall be configured as an extension of the existing system. New NVR storage is not required. All licensing shall be provided by this contractor for cameras related to this project.
3. Major features of the Video Surveillance System and responsibilities to furnish and/or install are as follows:
   a. IP (Network) Cameras.
   b. Camera Housings
   c. Camera Mounts
d. Power conditioning equipment (Surge Suppressors).
e. All equipment, cables and related termination, support and grounding hardware, bonding as required for a full and functioning system, shall be installed, wired, tested, labeled, and documented by the Contractor, as detailed in this and related section(s).

4. Category 6A cabling for CCTV cameras will be installed by the low voltage installer, not the Security contractor.

B. General Positioning and Lens Adjustment - Preliminary

1. Prior to rough-in at camera locations, the contractor shall demonstrate all camera locations for the purposes of making final camera position and lens adjustments. Contractor shall provide 14 day notice (minimum) to allow for participation by DFCI, Agency staff and Engineer.

a. Demonstration of the camera view at each location shall be as follows:
   1) Place representative camera at the given location and display the video on a temporary monitor or workstation. Provide laptop computer or other suitable display as required to perform this work.
   2) Camera placement may be by temporary support or by holding the camera in place by hand. (The Technician should not be visible in the image.)
   3) Agency representative and Construction Representative will direct the contractor to the desired field of view at that location.
   4) Document the approved field of view by saving the image electronically (preferred), taking a still photo of the viewing monitor or other approved means.
   5) No agency staff, inmate, resident, student, etc. shall be visible in the recorded images. Contractor personnel—with face or other identifying features obscured—may be visible in an image if required for purposes of scale.
   6) At locations where Pan-Tilt-Zoom capabilities are called for, the movement of the camera shall be simulated and the views at the extents of this movement documented.

1.5  28 50 01.01  GENERAL

A. All workmanship and materials shall be in full conformance with applicable building, electrical, and other codes, as determined by the authority having jurisdiction (AHJ).

B. All cabling system components shall be Underwriters Laboratories (UL) or ETL Listed and shall be marked as such.

1.6 Reference list

A. The product specifications, design considerations, and installation guidelines provided in this document are in part derived from recommendations found in recognized telecommunications industry standards. The following are used as reference:

1. Spaces and Pathways
   b. TIA-569-D (2015) – Commercial Building Standard for Telecommunications Pathways and Spaces

2. Grounding
   a. ANSI-J-STD-607-C (2015) – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   b. EN 50310, Application of Equipotential Bonding and Earthing in Buildings with Information Technology Equipment

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3. Cabling Systems
   d. TIA-1179 (2010) - Telecommunications Infrastructure Standard for Healthcare Facility
4. Cabling Administration

B. In cases where product specifications, design considerations, and installation guidelines provided in this document are in conflict with the references listed above, the more stringent requirements shall apply. All references listed above were current during development of this publication. The bidder is responsible for referencing to the most recent releases when developing bid proposals.
   a. This document does not take precedence over any code, either partially or wholly.
   b. Reference the DFCI Police and Security Standards for further requirements.

1.7 GENERAL CONDITION – APPROVED VENDOR
A. General
   1. The bidder must be an authorized DFCI Police and Security Installer.
   2. The successful bidder shall hereinafter be referred to as the Vendor.
   3. The Vendor shall accept complete responsibility for the design, installation, acceptance testing, and certification of the telecommunications system.

PART 2 - APPROVED PRODUCTS

2.1 General
   1. Refer to DFCI Police and Security Standards for approved Manufacturers and Materials

2.2 Approved Products
A. Video Surveillance System
   1. Video surveillance Cameras
      a. Interior Fixed Dome Camera
      b. Resolution: 1080p
      c. Vari Focal Lens: 2.8 – 9.5mm
      d. WDR: 133dB
         1) Panasonic WV-S2131
B. Access Control System
   1. System
      a. Software House. CCURE 9000 system
      b. iStar control panels.
   2. Power Supplies
      a. Altronix
         1) Multi Output Power Controller
            a. Altronix eFlow6NA8D

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2) Power Supply
   a. Altronix eFlow6NX

3. Battery
   a. Oracle
      1) Sealed Lead Acid AGM Battery
      2) 12 Volt, 8 Amp Hour
      3) Oracle FS1278
   b. Oracle
      1) Sealed Lead Acid AGM Battery
      2) 12 Volt, 18 Amp Hour
      3) Oracle FS12180
   c. Enclosure
      1) Kele
      2) NEMA-1 enclosure
      3) Size: 38” High x 26” Wide x 7” Deep
      4) Color: Dark Blue
      5) Kele RET3826-DB

C. Fire Alarm Relay
   a. SPDT Contact
   b. UL Certified
   c. 12VDC or 24VDC
      1) Altronix RB30

D. Door contacts:
   1. GE P/N 1076

E. Card readers
   a. HID RP40
   b. HID RKP40/R15.

F. Request to exit detectors
   a. Bosch, P/N DS160

G. Composite Security Cable
   1. Plenum Rated
   2. Stranded Bare Copper with 6 Elements:
      a. Elem 1: 22AWG, 6C (Black/White/Red/Green/Brown/Blue) [Card Reader]
      b. Elem 2: 22AWG, 2C (Black/Red) [Door Contact]
      c. Elem 3: 22AWG, 2C (Black/Red) [REX]
      d. Elem 4: 18AWG, 2C (Black/Red) [Lock Power]
      e. Elem 5: 18AWG, 2C (Black/Red) [RED Power]
      f. Elem 6: 18AWG, 2C (Black/Red) [Spare]
      1) Windy City Wire CGLSKIP6

PART 3 - WORK INCLUDED

A. General
   1. The work included consists of all labor, equipment, products, and supplies required to design, install, test, and warranty the system in compliance with project specifications.
   2. All cable shall be installed in accordance with the project drawings and Section 271000.

B. Drawings Specifications
1. General
   a. All drawings and plans provided with this document are diagrammatic. They are included to show the scope of the project in order to assist in the development of bid documents. The Vendor shall make allowances in the bid proposals to cover the work required to comply with the intent of the drawings and plans.
   b. The Vendor shall verify all dimensions at the site and is responsible for their accuracy.
   c. Prior to submitting a bid, the Vendor shall indicate:
      1) Any specified materials the Vendor believes to be inadequate.
      2) Any necessary items of work omitted from the bid specification.

C. Delivery, Storage, and Handling
   1. General
      a. Delivery and receipt of project materials shall be coordinated with the general contractor and owner.
      b. All cable to be used in the project shall be stored according to manufacturer’s recommendations. In addition, all cable must be stored in a protected area. If cable is stored outside, it must be covered with opaque plastic or canvas for protection from the elements, with adequate ventilation to prevent condensation. If air temperature at the cable storage location will be below 4.4 °C (40 °F), the cable shall be moved to a heated location [minimum 10 °C (50 °F)]. If necessary, cable shall be stored off-site at the Vendor’s expense.
      c. If the Vendor intends to provide a trailer on-site for the storage of project materials, prior approval must be obtained from the owner of the system.

D. Testing and Acceptance
   1. General labeling
      a. All terminated cabling runs shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements found in the TIA/EIA-568-C series of standards. All pairs in each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation, including (but not limited to) cables, connectors, patch panels, and cordage shall be repaired or replaced in order to ensure 100% usability of all installed runs.
      b. Copper channel testing (see TIA-1152 TESTING STD)
      c. All balanced twisted-pair cable links shall be tested for basic continuity and length, as indicated below. The extent of testing shall be in accordance with the end-customer's testing requirements. Test 100% of the permanent links.

E. Warranty and Services
   1. Qualification of system
      a. The installed system shall be covered by the DFCI Police and Security required warranty program.

F. Cabling Terminations
   1. Copper termination hardware installation
      a. Cables shall be dressed and terminated in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.
      b. The termination device holding the wires in place at the rear of the connector shall withstand a tensile force of 15 lbs. minimum applied to the cable without impacting the cable/connector continuity.
c. Cables shall be neatly bundled, dressed, and routed to their respective termination connectors.

d. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support element(s). Labels obscured from view shall not be acceptable.

G. Communications Copper Horizontal Cabling
1. Horizontal cables
   a. Cables shall be manufactured by Windy City or Belden.
   b. Cables to access control doors shall be composite cable consisting of the following cables: 18/2, 22/6, 22/4, 22/2 AWG.
   c. All cabling shall be plenum rated.
2. Horizontal cable installation
   a. Horizontal cables shall be installed in accordance with standards-based recommendations, the manufacturer’s recommendations/installation guides, and industry best practices.
   b. A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb) shall be co-installed with the cable in any conduit.
   c. Cable raceways shall not be filled greater than the TIA-569-D recommended maximum fill for the particular raceway type, of initially no more than 25%.
   d. Cables shall be installed in continuous lengths from origin to destination. An exception is made for one CP in any cabling run.
   e. Where cables are installed in an air return plenum, any non-plenum cable shall be installed in metallic conduit.
   f. If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at every 1.2 m to 1.5 m (48 in to 60 in) intervals. It is recommended that the support surface is rounded without any sharp edges and at least 2 inches wide. Do not exceed the manufactures recommended quantity of cables for the cable support system. At no point shall cable(s) rest on acoustic ceiling grids or panels.
   g. Horizontal cables shall be bundled in groups of no more than 48 cables. Cable bundle quantities in excess of 48 cables may cause deformation of the bottom cables within the bundles, which will degrade the performance of those cables.
   h. Cable shall be installed above fire-sprinkler systems and shall not be attached to such systems or any associated ancillary equipment or hardware. The cabling system and its associated pathways shall be installed so that they do not obscure any valves, fire alarm conduit(s), boxes, or other control devices.
   i. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Vendor shall install appropriate carriers to support the cabling.
   j. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Vendor prior to final acceptance at no cost to the owner.

END OF SECTION
APPENDIX A
DANA 14 DOOR HARDWARE SPECIFICATIONS
DOOR SPECIFICATIONS:

I. **DOOR AND WINDOW FRAMES**: welded hollow metal frames

II. **VISION KIT**: Clear tempered safety glass. See Door Types on drawings

III. **WOOD TYPE**: Maple plain sliced (slip match) veneer custom stained to match PL-1. Veneer size shall be 5” minimum.

IV. **METAL TYPE**: Painted hollow metal door.

V. **HARDWARE FINISHES**: all door hardware shall be Satin/brushed Chrome US26D.

VI. **MORTISE LEVER HANDLES**: P Lever Design Sargent 8200 Series mortise locksets; Finish: US26D Satin Chrome

VII. **WiFi LOCK**: Sargent Profile WiFi Lock (28-10G777 LKL)

VIII. **CYLINDRICAL LEVER HANDLES**: P Lever Design Sargent 10 Line locksets; Finish: US26D Satin Chrome.

IX. **CARD READER DOORS**: Sargent 8200 Series with RX Option, 24 Volt Electric Mortise Lock set, with LCN Manual Closer 4010 Series, with Middle Electric Hinge

X. **CYLINDERS**: Sargent 7300 B or equal, Interchangeable core cylinders, owner to provide the seven pin core. Contractor to coordinate keying with DFCI grand master system.

XI. **EXIT DEVICES**

1. Surface Vertical Rod with Electric Latch Retraction
2. 56-12-NB8710 (no trim) exit only
3. 56-12-NB8713- ETL (locks and unlocks trim)
4. 56-12-NB8715- ETL (trim is always operable)

XII. **ELECTRIC HOLDER/CLOSER:** LCN 4040 Series tied to the fire alarm, low voltage (24 Volt); surface mounted wall magnet (Rixson FM 998 or approved equal) on corridor wall doors only

XIII. **MANUAL HOLDER/CLOSER:** LCN 4010 series

XIV. **HINGES:** McKinney TA2714 (4 ½” x 4 ½”) or approved equal

XV. **DOOR SILENCERS:** Rockwood #608

XVI. **DOOR STOPS:** Wall mounted Rockwood #406

XVII. **KICKPLATES:** Stainless steel in sizes shown on the drawings

XVIII. **DOOR AND WINDOW GLASS (GL-1):** Clear tempered safety glass.
APPENDIX B

DFCI DANA 14 - CORE - EQUIPMENT MATRIX BY ROOM
### DFCI Dana 14 - Core - Equipment Matrix by Room

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Equipment Dimensions</th>
<th>Utilities Required</th>
<th>Remarks</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>TISSUE (SHARED)</td>
<td>14' x 15'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMAGING ROOM</td>
<td>14' x 15'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microscope Room</td>
<td>14' x 37'</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold Room</td>
<td>14' x 50'</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Equipment Dimensions

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Equipment Dimensions</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microscope</td>
<td>36' x 9' x 30'</td>
<td>110V 20A</td>
</tr>
<tr>
<td>Fume Hood</td>
<td>48' x 30' x 30'</td>
<td>20A</td>
</tr>
<tr>
<td>BSC</td>
<td>4' x 0'</td>
<td>20A</td>
</tr>
<tr>
<td>Incubator</td>
<td>4' x 0'</td>
<td>110V 20A</td>
</tr>
<tr>
<td>Centrifuge</td>
<td>30' x 30' x 30'</td>
<td>200A</td>
</tr>
<tr>
<td>Waterbath</td>
<td>36' x 9' x 30'</td>
<td>20A</td>
</tr>
</tbody>
</table>

#### Utilities Required

- **110V 20A**
- **200A**
- **20A**

**Notes:**
- Equipment dimensions and electrical requirements vary.
- Some equipment requires specific models or models not yet purchased.
- Contact Cindy for specific model details.
APPENDIX C COVER

APPENDIX C
EQUIPMENT LIST MASTER
<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Quantity</th>
<th>Util. Conn. Loc.</th>
<th>Length</th>
<th>Depth</th>
<th>Height</th>
<th>Volts</th>
<th>Amps</th>
<th>Pole</th>
<th>AKF Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher -20 freezer, small</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>115</td>
<td>8.8</td>
</tr>
<tr>
<td>-20 freezer, standard</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>115</td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>4 degree fridge</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>115</td>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Cell culture incubators</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>120</td>
<td></td>
<td>Y</td>
<td>CO2 needed for each incubator</td>
</tr>
<tr>
<td>Liquid nitrogen tank</td>
<td>1</td>
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<td></td>
<td></td>
<td>120</td>
<td></td>
<td>Y</td>
<td>LN2 tank needed</td>
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<tr>
<td>bacterial fridge</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
<td>115</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Legend XTR centrifuge</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td>120</td>
<td></td>
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<td>AKF needs cut sheet, assuming 120V, 16A, NEMA 5-20R</td>
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<tr>
<td>Western blot rocker</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Corning LSE orbital shaker</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td>120</td>
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</tr>
<tr>
<td>Trans blot turbo</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Corning LSE digital dry bath</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td>120</td>
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<td></td>
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<tr>
<td>Thermo Legend micro 21 tabletop centrifuge</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100 or 120</td>
<td></td>
<td>AKF needs cut sheet, assuming 120V, 16A, NEMA 5-20R</td>
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<td>Thermo Legend micro 21R tabletop centrifuge</td>
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<td></td>
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<td>100 or 120</td>
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<td>AKF needs cut sheet, assuming 120V, 16A, NEMA 5-20R</td>
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</tr>
<tr>
<td>ProFlex PCR system</td>
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<td></td>
<td></td>
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<td>Digital scale</td>
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<td></td>
<td></td>
<td>120</td>
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</tr>
<tr>
<td>Fisher isotemp water bath</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td>120</td>
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<tr>
<td>Fisher isotemp GDP05 water bath</td>
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<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Bacterial water bath</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>120</td>
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<td></td>
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</tr>
<tr>
<td>Table top tube rotator</td>
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<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Desktop computers</td>
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<td>6</td>
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<tr>
<td>Fisher isotemp magnetic stirrer</td>
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<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Countess cell count machine</td>
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<td></td>
<td></td>
<td>120</td>
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<tr>
<td>Cell microscope + imaging screen</td>
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<td></td>
<td></td>
<td>120</td>
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<td>-80 Freezer</td>
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<td>120</td>
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</tbody>
</table>

**WAGLE WET LAB**

**DFCI Dana 14 - Wagle - Equipment Matrix**

**BID SET**

**3/06/2020**
ISSUANCE:
DATE:

BID SET
3/06/2020

Hill Lab - Equipment Matrix

H01
H02
H03
H04
H05
H06
H07
H08
H09
H10
H11
H12
H13
H14
H15
H16
H17
H18
H19
H20
H21
H22
H23
H24
H25
H26
H27
H28
H29
H30
H31
H32
H33
H34
H35
H36

Tenant / Department
Room Number:
Floor
Tenant / Department
Floor

Hill
1412
14

Hill
14

Microwave
RT PCR Machine-AB StepOne Plus RealTime PCR System
Hot plates x2
Laxco Cell Culture Microscope, will also have a computer and camera attached, so maybe increase height and add computer when thinking about this

2
1
1
11

1 1

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1 1
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31 3 1
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1 21
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11
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11

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2
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1

1
1

Amps
50-60hz
5
5

20 inches
11
8.5 inches
11 inches
8 inches
10 20 inches
14

20 inches
8 inches
7 inches
9 inches
8 inches
8
20 inches
5.5
11
8 inches
7
11
inches
9
inches
12 inches
12 inches
12 8 inches 12 8 inches
10
8
10 inches
8
14
5.5
11 inches
12 inches
12
12 7
12 inches 6 inches
12 inches
6 inches
12 inches
4 inches
12
12
295mm
10 inches 400 mm
8
24.511 inches 28 12 inches
22.212
inches
20.9 inches
12
14.9 inches
6 inches 11.4 inches
6 inches
9 inches
5.5 inches
12 inches 66 cm4 inches
77 cm
295mm
400 mm
22 inches
12 inches
24.5
28
10 inches
18 inches
22.2
inches
20.9 inches
9
9
14.9 inches24 cm11.4 inches
24 cm

9 inches
77 cm
22 inches
10 inches
9
24 cm

5.5 inches
66 cm
12 inches
18 inches
9
24 cm

20 inches
3
25 inches
7 inches
11 inches
8.5
20 inches
9.75
3
35
7
12 inchesinches
11 inches
12
8.5
8
9.75
3 inches
35
6 inches
12 inches
6 inches
8 inches
12
150mm8
10.5 3 inches
28.3 6 inches
9 inches
6 inches
9 inches
8 inches
37 cm
150mm
16 inches
10.5
20 inches
28.3
5 inches
38.1 cm9 inches

9 inches
37 cm
16 inches
20 inches
5 inches
38.1 cm

standard product like Dell
120
120
100-240V
24V
Not yet sure, would be 0.5Amps
18W Maximum
RF product
Power like Dell
standard
Motor power is 373 W

120
100-240V
24V
120V 18W Maximum RF Power
100-120VMotor power is 373 W

X

110 V
120 V
110 V
100-120V120V
100-240VAC
100-120V
120 v 110 V
100-240 V
120 V
100-240
110 V
230 V
120 V 100-120V
100-240 100-240VAC
VAC
120V 120 v
100-240 V
100-240VAC

100-240
230 V
120 V
100-240 VAC
120V
100-240VAC

X
X

X

X

X
X
50-60Hz

X

X

X
X
50-60Hz

50-60Hz

Other (remarks)

AKF Comments

Unlikely to purchase. See 11/17/19 email.
Unlikely to purchase. See 11/17/19 email.

AKF assuming 120V,5A, NEMA 20-R
AKF assuming 120V,10A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R
AKF assuming 120V,10A, NEMA
20-R
AKF assuming
120V,5A, NEMA 20-R

AKF assuming 120V,10A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R
AKF assuming
AKF assuming 208V, 10A, NEMA
L6-20R 120V,10A, NEMA 20-R
AKF assuming 120V,10A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R
AKF assuming 120V,10A, NEMA 20-R
AKF assuming
AKF assuming 120V, 10A, NEMA
5-20R 208V, 10A, NEMA L6-20R
AKF assuming 120V,10A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R

X

?

Data

Alarm (CAM)

Cup Sink (No H2)

ExhaustOther
Vent(remarks)

Alarm (CAM)

Inert Gas
(Clarify)
Data

Cup Sink (No H2)

Vacuum

Exhaust Vent

Gases (remarks)

Inert Gas (Clarify)

Vacuum

Comp. Air

Gases (remarks)

X
X
X
X
X
X

X

Remarks / Location

AKF Comments

Unlikely to purchase. See 11/17/19 email.
Unlikely to purchase. See 11/17/19 email.

X
X

?

0.5Amps

Remarks / Location

?

X
50-60hz

32 inches
52.87 inches
81 inches Unclear, we have not purchased
5
21 inches
21 inches
32 inches and are working
?-not sure
with Cindy for
32.13 inches
34 inches
73.13 inches
5
specific models
40 inches
34 inches
77 inches
34.6
25 inches
74 inches
120
Unclear, we have not purchased 50-60Hz
8 inches
8
13
120
and are working with Cindy for
specific models
inches 7 inches
34 inches
77 inches 120
8.5 40
inches
25 inches
34.6
25 inches
74 inches
120
Not yet sure,
8 inches
8
13
120 would be

X
X

Pole
X
X

2.6

Steam

?

Volts

Chilled H2O (S&R)

Pole

Comp. Air
RO Water

Amps
2.6

Steam
Lab Water

Height
Volts
150cm
23 cm
100-240
Height120
8.875 cm
150cm
32 inches
?-not sure
81 inches
23 cm
100-240
32 inches
8.875 cm ?-not sure
120
73.13 inches
32 inches
?-not sure

Lab Water

Electrical Requirements

Chilled H2O (S&R)
Em. Power

Length
Depth
75 cm
47 cm
37 cm
Length 9.25 cm
Depth
12.675 cm
75 cm
21 inches
21 inches
32 inches
52.8737
inches
47 cm
cm
21 inches
12.675 cm 21 inches
9.25 cm
32.13
21inches
inches 34 inches
21 inches

***in inches

SpecialRO
Plug
Type Req?
Water

Equipment Dimensions

Electrical Requirements

UTILITIES REQUIRED

Em. Power

***in inches

Special Plug Type Req?

Equipment Dimensions

Installed By GC ?

Supplied By GC ?

Floor Mounted

11
11
21

1
1
11

13
Harrick Basic Plasma Cleaner https://harrickplasma.com/plasma-cleaners/basic-plasma-cleaner/
2
Heat blocks (2)
1
Argon Gas tank
Eppendorf thermomixer.
1
12
Dessicator Cabinet (Fisher 305317-0070)
Genomic Vision
11
Dessicator
Harrick Basic
Plasma
Cleaner
11
Rotating
tube
rack forhttps://harrickplasma.com/plasma-cleaners/basic-plasma-cleaner/
room temp washes Fisher 88881001
BASIC OIL-BASED
VACUUM
PUMP,
115V
(INCLUDES
Power source
to run gels
BioRad
PowerPac
300 HOSE AND HOSE CLAMPS). P/N PDC-VPE. (https://harrickplasma.com/vacuum-pumps/oil-based-2 1
Argon Gas Rotator
tank for western washes and Coomassie washes
21
11
Dessicator Vortex
Cabinet (Fisher 305317-0070)
11
Dessicator Impulse sealer for western blot bags
11
Eppendorf
BasicFisher 88881001
Rotating tube
rack forBiospectrometer
room temp washes
12
Nucleofector
4DBioRad
(Core Unit
and X Unit)
Power source
to run gels
PowerPac
300https://bioscience.lonza.com/lonza_bs/CH/en/Transfection/p/000000000000203684/4D-Nucleofector-Core-Unit
Fisher Scientific Isotemp incubator 51030513
12
Rotator for western washes and Coomassie washes
Water bath (Fisher 6783)
1
1
Vortex
Countess II Fisher AMQAF1000
1
1
Impulse sealer
forEppendorf
western blot
bags with microplate adaptors
5910R
centrifuge
1

Eppendorf Biospectrometer
Basic
Microwave
Nucleofector
Unit and
X Unit)Plus
RT4D
PCR(Core
Machine-AB
StepOne
RealTime PCR System
Fisher Scientific
Isotemp
incubator
51030513
Hot plates x2
Water bath Laxco
(Fisher
6783)
Cell
Culture Microscope, will also have a computer and camera attached, so maybe increase height and add computer when thinking about this
Countess II Fisher AMQAF1000
5910R Eppendorf centrifuge with microplate adaptors

1
1
2

Supplied
By GC ?
Installed By GC ?

1
1
2
11
11
12
11

Floor Mounted

Bench Mounted

UTILITIES REQUIRED

Bench Mounted

Equipment Name

Quantity

Equipment Name

Quantity

DFCI ID #

HILL (WET LAB)
1412

Fiber Vision S Scanner (Genomic Vision gave no further info http://www.genomicvision.com/products/molecular-combing-platform/scanner/)
H01 Medical Oncology
Tecan D300 E Drug Printer (https://lifesciences.tecan.com/products/liquid_handling_and_automation/tecan_d300e_digital_dispenser)
H02
Table top microcentrifuges Eppendorf 5425
H03
Fiber Vision4CS under
Scanner
(Genomic
Vision gave no further info http://www.genomicvision.com/products/molecular-combing-platform/scanner/)
Medical
Oncology
counter
refrigerator
H04
4 degree
FBG45RSLA)
E Drug
Printer(Fisher
(https://lifesciences.tecan.com/products/liquid_handling_and_automation/tecan_d300e_digital_dispenser)
H05 Tecan D300Large
Minus 20 freezer Eppendorf
Under Counter
H06 Table top microcentrifuges
5425
Minus 20
Freezer large (Fisher 20LFEEFSA)
H07 4C under counter
refrigerator
Large 4 degree (Fisher FBG45RSLA)
Under Counter
-80 freezer
H08 Minus 20 freezer
Minus 20 Freezer large (Fisher 20LFEEFSA)
Tissue culture incubator stack (Fisher PD51030284, 2 stacked)
H09
H10 -80 freezer Thermal cycler
Fluorescent microscope-May not purchase, would need special space
H11
Epson Scanner
H12
Tissue culture incubator stack (Fisher PD51030284, 2 stacked)
Desktop Computers 2 at desks and 1 at microscope.
H13 Thermal cycler
Fluorescent microscope-May not purchase, would need special space
Heat blocks (2)
H14 Epson Scanner
Eppendorf thermomixer. 1
H15
H16
Desktop Computers 2 at desks and 1 at microscope.
H17
H18
H19
H20
H21
H22
H23
H24
H25
H26
H27
H28
H29
H30
H31
H32
H33
H34
H35
H36

Hill Lab - Equipment Matrix

HILL (WET LAB)

Room Name:
Room Number:

Department / Group

DFCI ID #

DepartmentE4H
/ Group
ID #

E4H ID #

Room Name:

X
X

AKF assuming 120V,6A, NEMA
AKF 5-20R
assuming 120V,10A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R
AKF assuming 120V, 10A, NEMA 5-20R
AKF needs cut sheet, assuming 120V,5A, NEMA 20-R
AKF needs cut sheet, assuming 120V,5A, NEMA 20-R
AKF needs cut sheet, assuming
120V,5A, NEMA
20-R NEMA 5-20R
AKF assuming
120V,6A,
AKF assuming 120V,3A, NEMA 20-R
AKF assuming 120V,5A, NEMA 20-R
What equipment requires Argon supply?
AKF needs
cutNEMA
sheet,20-R
assuming 120V,5A, NEMA 20-R
AKF needs cut sheet, assuming
120V,5A,
AKF needs cut sheet, assuming 120V,5A, NEMA 20-R
Need equipment cut.
Small Glass bowl. Dimensions revised during 12/11/19 call
AKF 20-R
needs cut sheet, assuming 120V,5A, NEMA 20-R
AKF assuming 120V,3A, NEMA
AKF assuming
120V,3A, NEMA 20-R
AKF aassuming 120V,5A, NEMA
20-R
What20-R
equipment requires Argon supply?
AKF aassuming 120V,5A, NEMA
AKF needs
cut NEMA
sheet,20-R
assuming 120V,5A, NEMA 20-R
AKF needs cut sheet, aassuming
120V,5A,
20-R
Need
equipment cut.
Small Glass bowl. Dimensions revised during 12/11/19AKF
callassuming 120V,3A, NEMA
AKF needs cut sheet, aassuming
120V,5A, 120V,3A,
NEMA 20-RNEMA 20-R
AKF assuming
AKF needs cut sheet, aassuming
120V,5A, NEMA
20-R NEMA 20-R
AKF aassuming
120V,5A,
AKF assuming 120V, 5A, NEMA
10-20R
AKF aassuming
120V,5A, NEMA 20-R
AKF assuming 120V, 5A, NEMA 5-20R
AKF needs cut sheet, aassuming 120V,5A, NEMA 20-R
AKF needs cut sheet, aassuming 120V,5A, NEMA 20-R
AKF assuming 120V,3A, NEMA 20-R
AKF assuming 120V, 10A, NEMA 5-20R
AKF needs
AKF assuming 120V, 10A, NEMA
5-20Rcut sheet, aassuming 120V,5A, NEMA 20-R
AKF needs
cut sheet,
120V,5A, NEMA 20-R
AKF needs cut sheet, aassuming
120V,10A,
NEMA aassuming
20-R
AKF
assuming
120V, 5A, NEMA 10-20R
AKF assuming 120V, 5A, NEMA 5-20R
AKF assuming
NEMA 5-20R
AKF needs cut sheet, aassuming
120V,10A,120V,
NEMA5A,
20-R

X
X

AKF needs cut sheet, aassuming 120V,5A, NEMA 20-R
AKF assuming 120V, 10A, NEMA 5-20R
AKF assuming 120V, 10A, NEMA 5-20R
AKF needs cut sheet, aassuming 120V,10A, NEMA 20-R
AKF assuming 120V, 5A, NEMA 5-20R
AKF needs cut sheet, aassuming 120V,10A, NEMA 20-R


<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Equipment Dimensions</th>
<th>Electrical Requirements</th>
<th>UTILITIES REQUIRED</th>
<th>BID SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>GelImager</td>
<td>(*)</td>
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<tr>
<td>Sonicator</td>
<td>(*)</td>
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<tr>
<td>Reliable Science SKU: RS55D-1114</td>
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<tr>
<td>Bacterial Shaker</td>
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<tr>
<td>Thermocycler (Eppendorf)</td>
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<tr>
<td>Waterbath (large)</td>
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<tr>
<td>Nanodrop 8000 (needs attached PC)</td>
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<tr>
<td>Pole</td>
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<tr>
<td>Core</td>
<td></td>
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<tr>
<td>Thermomixer  C (Eppendrof)</td>
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<tr>
<td>Underbench Fridge/Freezer (~10 total over 3 bays)</td>
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<tr>
<td>ENDURO™ UV Transilluminators</td>
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<tr>
<td>Eppendorf 5810R</td>
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<td>Spectrolinker XL-1500</td>
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<td>Titramax 1000 544-12200-00</td>
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<tr>
<td>Centrifuge, tabletop (Eppendorf 5810R)</td>
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<td>qPCR Machine (also needs attached PC)</td>
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<tr>
<td>Tecan D300e Drug dispenser (with Hood) - tentative</td>
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<tr>
<td>Computer</td>
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<tr>
<td>Inert Gas (Clarify)</td>
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