SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Contractor use of site and premises.

B. Work Sequence.

C. Owner Occupancy.

D. Summary of the Work.

1.02 CONTRACTOR USE OF SITE AND PREMISES

A. Limit of site and premises to allow:

1. Owner occupancy of existing hospital building.

2. Use of existing hospital building and premises by public.

1.03 WORK SEQUENCE

A. Coordinate construction schedule and operations with Contracting Officer and Owner's representative.

B. Construction Phasing: Work involving alterations and/or additions to existing occupied areas shall be programmed and phased to minimize disruption of existing functions. Access, exits, and fire protection shall be so maintained that the occupant's safety health, and reasonable comfort will not be jeopardized during construction.

1.04 OWNER OCCUPANCY

A. The Owner will occupy the existing hospital building during entire period of construction.

B. Cooperate with Owner to minimize conflict and noise, and to facilitate Owner's operations. Contractor shall work with the hospital staff to minimize interference of hospital operations.

C. Schedule all Work to accommodate this requirement.

1.05 SUMMARY OF WORK

A. Architectural

1. Removal of existing and providing new ceiling.
2. Providing hoarding walls to isolate each phase under construction from the rest of the surrounding area which will be operational during construction of this project.

B. Electrical

1. Removal of existing and providing new lighting fixture.

C. FIRE PROTECTION

1. Removal of existing and providing new sprinkler heads with flexible piping.

D. MECHANICAL

1. Modify Air Conditioning and Exhaust Systems for OR#1, OR#2, OR#3, OR#4 and CL.

E. STRUCTURAL

1. Provide new catwalk above the ceiling.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01020
PHASING OF CONSTRUCTION

PART 1 - GENERAL

1.01 HOSPITAL OPERATIONS

A. Contractor will work with the hospital staff to minimize interference of hospital operations.

1.02 MATERIALS AND SUPPLIES

A. The Contractor shall not begin a phase area before all supplies for that work are on-island.

1.03 GENERAL REQUIREMENTS

A. Replacement modification shall be phased must be operational before starting removal work.

B. Hoarding wall must be provided to isolate each phase under construction from the rest of the surrounding area which will be operational during construction of this project.

C. Before submitting a bid, contractor shall familiarize themselves with Hospital regulations that could impact their construction time.

D. All related Architectural, Structural, Electrical & Fire Sprinkler work shall be done in concert with mechanical work.

END OF SECTION

SECTION 01039
COORDINATION AND MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Coordination.

B. Field engineering.

C. Preconstruction conference.

D. Site mobilization conference.

E. Progress meetings.

1.02 RELATED SECTIONS

A. Section 01010 Summary of Work - Work Sequence, Owner Occupancy

B. Section 01045 Cutting and Patching.

C. Section 01049 Mechanical and Electrical Coordinator.

1.03 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of Specifications to assure an efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

1.04 PRECONSTRUCTION CONFERENCE

A. Attendance Required: Owner, Contracting Officer, Engineer and Contractor.

B. Agenda:

1. Submission of executed bonds and insurance certificates.

2. Distribution of Contract Documents.

3. Submission of list Subcontractors, list of products, Schedules of Values, Construction Phasing Schedule, and Progress schedule.

4. Designation of personnel representing the parties in Contract, and the Contracting Officer.

5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.

6. Scheduling and Phasing of the Work.

1.05 SITE MOBILIZATION CONFERENCE

A. Contracting Officer will schedule a conference at the project site prior to Contractor occupancy.

B. Attendance Required: Owner, Contracting Officer, Special Consultants, and Contractor and major Subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor.

2. Owner's requirements and partial occupancy.

3. Construction facilities and controls provided by Owner.

4. Temporary utilities provided by Owner.

5. Survey and layout.

6. Security and housekeeping procedures.

7. Environmental protection, construction facilities and temporary controls.

8. Schedules.

9. Procedures for testing.

10. Procedures for maintaining record documents.

11. Requirements for start-up of equipment.

12. Inspection and acceptance of equipment put into service during construction period.

1.06 PROGRESS MEETINGS

A. The Contracting Officer will schedule and administer meetings throughout progress of the Work at weekly intervals.

B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Contracting Officer, as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01045
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Requirements and limitations for cutting and patching of Work.

1.02 RELATED SECTIONS

A. Section 01010 - Summary of Work

B. Section 01300 - Submittals

C. Section 01500 - Temporary Controls

D. Section 01560 - Environmental Protection

1.03 SUBMITTALS

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of Project.

2. Efficiency, maintenance, or safety of any operational element.

3. Environment, safety, or operation of any occupied area.

4. Acoustic integrity of any area of the Project.

B. Include in request:

1. Location and description of affected work.

2. Date and time work will be executed.

3. Proposed protection measures to assure efficiency, maintenance, and safety of operational elements, and acceptable environmental, safety and operations considerations for occupied areas.

PART 2 - PRODUCTS

A. Fire stopping sealant shall be one-part fire stop sealant and one of the following:

1. Dow Corning Fire Stop Sealant

2. 3M Fire Barrier Caulk CP-25

3. Fyre Putty, Product of Standard Oil Engineer Materials

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

B. After uncovering existing work, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Provide temporary supports to ensure structural integrity of the work. Provide devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering work.

3.03 CUTTING AND PATCHING

A. Execute cutting, fitting, and patching including excavation and fill complete work.

3.04 PERFORMANCE

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

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

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

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

E. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break.

F. Work shall meet acoustic performance requirements of each area of the project.

3.05 FIRE SAFING

A. All penetrations through rated walls, partitions and floors shall be fire-safed using one part fire stop sealant.

END OF SECTION

SECTION 01049
MECHANICAL AND ELECTRICAL COORDINATOR

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mechanical and Electrical Coordinator.

B. Submittals.

C. Coordination required.

D. Coordination documents.

E. Coordination of submittals.

F. Coordination of substitutions and modifications.

G. Observation of Work.

H. Documentation.

I. Equipment start-up.

J. Inspection and acceptance of equipment.

1.02 RELATED SECTIONS

A. Section 01010 - Summary of Work.

B. Section 01039 - Coordination and Meetings: Coordination.

C. Section 01045 - Cutting and Patching: Cutting and Patching.

D. Section 01039 - Coordination and Meetings: Progress Meetings.

E. Section 01300 - Submittals.

F. Section 01300 - Submittals: Shop drawings, product data, and samples.

G. Section 01700 - Contract Closeout Procedures

1.03 MECHANICAL AND ELECTRICAL WORK COORDINATOR

A. Employ and pay services of a person technically qualified and experienced in field coordination for the type of mechanical and electrical work required for this Project, for the duration of the Work.

B. The electrical and mechanical coordinator should be a separate person from the project manager, project engineer or supervisor. The coordinator should be able to provide training and in service assistance to end user.

1.04 SUBMITTALS

A. Submit name, address, and telephone number of Coordinator to Contracting Officer for approval.

B. Submit coordination drawings and schedules prior to submitting shop drawings, product data, and samples.

1.05 COORDINATION REQUIRED

A. Coordinate work of Division 2, 9, 15 and 16, with work of other Divisions.

B. Coordinate the work with progress schedules established under Section 01300, including dates for submittals and for delivery of products.

C. Conduct conferences among Subcontractors and separate contractors and other concerned with the Work, to establish and maintain coordination and schedules.

D. Participate in progress meetings. Report on progress of Work to be adjusted under coordination requirements, and any required changes in schedules. Transmit minutes of meetings and reports to concerned parties.

1.06 COORDINATION DOCUMENTS

A. Prepare coordination drawings to organize installation Products for efficient use of available space, for proper sequence of installation, and to identify potential conflicts.

B. Prepare a master schedule to identify responsibilities under each section of Division 1 through 16 of the Specifications for activities which directly relate to this work, including submittals and temporary utilities. Identify electrical power characteristics and control wiring required for each item of equipment.

C. Maintain documents for the duration of the Work, recording changed due to site instructions, modifications or adjustments.

D. After Contracting Officer review of original and revised documents, reproduce and distribute copies to concerned parties.

1.07 COORDINATION OF SUBMITTALS

A. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination among work of all sections of the Project Manual. Transmit to Contractor for review, then transmit to Contracting Officer.

B. Check field dimensions and clearances and relationship to available space and anchors.

C. Check compatibility with equipment and Work of other sections, electrical characteristics, and operational control requirements.

D. Check motor voltage and control characteristics.

E. Coordinate controls, interlocks, wiring of pneumatic switches, and relays.

F. Coordinate wiring and control diagrams.

G. Review the effect of any changes on work of other sections.

H. Verify and coordinate maintenance of Record Documents.

1.08 COORDINATION OF SUBSTITUTIONS AND MODIFICATIONS

A. Review proposals and requests from subcontractors.

B. Verify compliance with Contract Documents and for compatibility with Work and Products of other sections.

C. Submit three (3) copies of documentation to Contracting Officer or Authorize Representative.

1.09 OBSERVATION OF WORK

A. Observe Work for compliance with Contract Documents.

B. Maintain a list of observed deficiencies and defects; promptly submit to Contractor.

1.10 DOCUMENTATION

A. Observe and maintain a record of tests. Record:

1. Specification section number, Product, and name of Subcontractor.

2. Name of testing agency and name of inspector.

3. Name of manufacturer's representative present.

4. Date, time, and duration of tests.

5. Type of tests, and results.

6. Retesting required.

B. Assemble background documentation for dispute and claim settlement by Contracting Officer.

C. Submit three (3) copies of documentation to Contracting Officer or Authorize Representative.

1.11 EQUIPMENT START-UP

A. Verify utilities, connections and controls are complete and equipment is in operable condition as required by Section 01650.

B. Observe startup and adjustments: record item and date of start-up, and results.

C. Observe equipment demonstrations to Owner: record times and additional information required for Operation and Maintenance Manuals.

1.12 INSPECTION AND ACCEPTANCE OF EQUIPMENT

A. Prior to inspection, verify that equipment is tested and operational, and clean.

B. Assist Contracting Officer with inspection. Prepare list of items to be completed and corrected.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Shop drawings.

E. Product data.

F. Manufacturer's instructions.

G. Manufacturer's certificates.

H. Construction photographs.

I. As-Built Drawings.

J. Equipment Manuals.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturer's field services and reports.

B. Section 01700 - Contract Closeout: Contract warranty and manufacturer's certificates.

1.03 SUBMITTAL PROCEDURES

A. Transmit each submittal with form acceptable to Contracting Officer.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification section number, as appropriate.

D. Apply Contractor'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 Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Contracting Officer.

F. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed work.

G. Provide space for Contractor and Contracting Officer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

J. Contractor shall provide an approved submittal log indicating the type submittal, scheduled submittal date and status of submittal approval.

1.04 CONSTRUCTION PROGRESS SCHEDULES

A. The Contractor shall prepare a computerized project schedule approved by Guam Memorial Hospital Authority and the Architect and shall be used to monitor the contractor's performance. The Contractor shall update and review the computerized the project schedule with Guam Memorial Hospital Authority and the Architect on a monthly basis or sooner if necessary.

1.05 PROPOSED PRODUCT LIST

A. Within 15 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.06 SHOP DRAWINGS

A. Submit six (6) copies.

B. After review, and distribute in accordance with Article on Procedures above and for Record Documents described in Section 01700 - Contract Closeout.

1.07 PRODUCT DATA

A. Submit a minimum of 4 copies, 3 are to be retained by Contracting Officer.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

D. Product data should include MSDS (Material Safety Data Sheets).

1.08 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturer's printed instruction for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.09 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Section, submit manufacturer's certificate to Contracting Officer's for review, in quantities specified for Product Data.

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 Contracting Officer.

1.10 AS-BUILT DRAWINGS

A. Upon completion of the contract, the contractor shall provide to the Owner a complete set of legible reproducible drawings showing all construction, fixed equipment, architectural, structural, mechanical, and electrical in clean, undamaged condition, with markup of actual installations as installed or built.

B. The Contractor shall also provide three (3) sets of as-built condition drawings in Autocad R14/2000 format and Autocad electronic copy in CD upon completion and acceptance of the project.

1.11 EQUIPMENT MANUALS

A. The Contractor shall furnish to the Owner three (3) binder sets of Equipment Installation, Operation and Maintenance Manuals.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Manufacturers' field services and reports.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of Manufacturers' Instructions and Certificates.

1.03 QUALITY ASSURANCE/CONTROL INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from the Contracting Officer before proceeding.

D. Comply with specified standards as a minimum quality for each the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship or specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities, Electricity, lighting, telephone service, water, and sanitary facilities.

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work.

C. Construction Facilities: Progress cleaning, project signage, and temporary buildings.

D. Erosion Control Facilities.

1.02 RELATED SECTIONS

A. Section 01020 - Phasing of Construction.

B. Section 01700 - Contract Closeout: Final cleaning.

1.03 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site and structure from damage.

1.04 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as required 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: Framing and plastic, dust tight sheet materials with closed joints and sealed edges at intersections with existing surfaces.

C. GMH is a smoke-free facility. There shall be no smoking inside the hospital. This applies regardless of the closure of an area for construction.

D. Contractor shall secure all work areas.

E. Contractor shall be responsible for maintaining all his on-site equipment secure against vandalism. All contractor supplies must be secured each day. The Contractor is responsible for the replacement of all items lost due to theft.

1.05 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections

1.06 PARKING

A. The Contractor is to adhere to the Hospital's policy in designated parking during construction.

1.07 DUST CONTROL AND PROGRESS CLEANING

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

B. Remove waste materials, debris, and rubbish from work areas daily and from site weekly and dispose off-site.

1.08 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

B. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.09 UTILITY OUTAGES

A. Contractor shall be advised that GMHA has specific procedures and programs to be placed in effect for utility outages.

B. Contractor shall familiarized himself with outage procedures and adhere to all requirements.

C. Any and all utility outages must be coordinated with GMHA two (2) weeks in advance.

1.10 WELDING WORK

A. GMHA requires the processing of a welding permit for all work within the Hospital facility.

B. Necessary documentation must be completed by Contractor prior to welding work.

1.11 UTILITIES

A. Source of water and electricity to be provided by Owner. Contractor to coordinate with Owner point of connections. Telephone is not required.

1.12 FIELD OFFICES AND SHEDS

A. No field office required.

1.13 ENCLOSURES

A. Furnish, install, and maintain for the duration of construction all scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, and other temporary construction necessary for proper completion of the work and protection of the public in compliance with pertinent safety and other regulations.

1.14 PROJECT SIGN

A. Provide 2 each 4' x 8' temporary construction sign of design to be provided by Engineer. Locate signs as indicated or as directed. Use new materials, 3/4" exterior plywood with hardwood edge trim; mount on nominal 4 x 4 posts.

Use primer and two coats of exterior paint on sign background and posts. Use exterior paint on lettering. Have lettering performed by a professional sign painter.

Allow no other signs (except safety, directional or warning signs) or advertising of any kind on the job site.

1.15 OWNERSHIP OF TEMPORARY FACILITIES AND CONTROLS

A. Items provided by the Contractor under this section shall remain the property of the Contractor and shall be removed from the job site immediately upon completion of the work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 ACCESS PROVISION

A. Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and to facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections. When permanent stairs are available for access during construction, cover finished surfaces with sufficient protection to ensure freedom from damage and deterioration at time of substantial completion.

3.02 SECURITY/PROTECTION PROVISION

A. The types of temporary security and protection provisions required include, but not by way of limitation, fire, protection, barricades, warning signs/lights, site enclosure fence, building enclosure/lockup, watchman service, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site.

B. The Contractor shall erect, install and maintain all temporary public roads and walkways, warning signs, barricades or other protective means in and around the site as deemed necessary or as may be ordered be the Architect/Engineer for effective protection of the public from injury and shall be held strictly liable for their safety.

END OF SECTION

SECTION 01560
ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Dust Control.

B. Noise Control.

1.02 RELATED SECTIONS

A. Section 01010 - Summary of Work

B. Section 01039 - Coordination and Meetings

C. Section 01500 - Construction Facilities and Temporary Controls: Construction Cleaning

1.03 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere, and into the air conditioning system.

1.04 NOISE CONTROL

A. Minimize noise transmitted by vibration into occupied portion of structures during demolition work. Accomplish this by first separating the portion to be demolished from the portion to remain.

B. Execute the separation from existing structure by cutting as specified in Section 01045 - Cutting and Patching.

C. Contractor shall comply with GMHA noise control policies.

1.05 ASBESTOS REMOVAL

A. In the event that asbestos is encountered in any existing elements of the building, the Contractor shall immediately stop work, notify the Owner and take all necessary precautions to protect persons in the vicinity from contamination.

B. The Contractor, the Owner and the Contracting Officer shall all cooperate to have the asbestos removed by licensed, qualified contractor as expeditiously as possible, at the Owner's expense.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01650
STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Starting systems.

B. Demonstration and instructions.

C. Testing, adjusting, and balancing.

1.02 RELATED SECTIONS:

A. Section 15000 - General Mechanical Requirements.

1.03 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Contracting Officer 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, or other conditions which may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of responsible Contractors' personnel in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of equipment and system under normal and emergency mode to Owner’s personnel two (2) weeks prior to date of final inspection.

B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item or equipment.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

1.05 TESTING, ADJUSTING, AND BALANCING

A. Provide the services of independent firm to perform services specified in Section 15500 paragraph 3.06 and 3.07

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final Cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.

1.03 CLOSEOUT PROCEDURES

A. 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 Contracting Officer's inspection.

B. Provide submittals to the Contracting Officer that are required by governing or other authorities. Record and submit occupancy permit. Submit lien releases as required by law.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy portions of the building as specified in Section 01010 - Summary of Work.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean debris from roofs, gutters, downspout, and drainage system.

C. Clean site, sweep paved areas, rake clean landscaped surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

6. As-Built Drawings - Reproducible set.

B. Store Record Documents separate from documents used for construction.

C. Specification: 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.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.

2. Details not on original Contract Drawings.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit three sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, capacity expansion binders with durable plastic covers.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Part 1: Directory, listings names, addresses, and telephone numbers of Contracting Officer, Contractor, Subcontractors, and major equipment suppliers.

E. Part 2: Operation and maintenance instruction. Identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

1. List of equipment.

2. Parts list for each component.

3. Operating instructions.

4. Maintenance instructions for equipment and systems.

5. Repair and maintenance instructions for special finishes including recommended cleaning methods and materials and special precautions identifying detrimental agents.

6. Complete electrical control diagram and schematics.

F. Part 3: Project documents and certificates, including the following:

1. Shop drawings and product data.

2. Certificates.

3. Photocopies of warranties.

4. As-built drawings including electrical control diagrams – reproducible set.

G. Submit one copy of completed volumes in final form, to the Government, 15 days prior to final inspection. This copy will be returned after final inspection, with comments. Revise contents of documents as required prior to final submittal.

H. Submit final volumes revised, within ten days after final inspection.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities as recommended by equipment manufacturer covering 1 year of recommended spare parts.

1.10 WARRANTIES

A. Contractor shall provide complete warrantee documentation for all items installed with a warranty provision. Documentation shall clearly state the start and end dates of each warrantee.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 02050

DEMOLITION AND REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Disconnection, capping and identification of utilities.

2. Removal and disposal of miscellaneous items that will be a hindrance or hazardous to the work to be done, as directed by the Owner=s representative.

3. Removal of suspended ceilings and components; light fixtures, grills and diffusers.

4. Removal of designated partitions and components; frames, doors and windows.

5. Removal of designated building equipment, fixtures and cabinetry.

6. Removal of designated finishes and specialty items.

7. Disconnection, capping and identification of utilities.

8. See Mechanical Sections for fire sprinkler, air conditioning and ventilation systems requirements.

9. See Electrical Sections for lighting, power and alarm systems requirements.

10. Protection of materials removed and stored for re-use.

11. Construction and maintenance of temporary partitions to allow continual occupancy of adjacent building areas.

12. Disposal of materials at approved off-site location(s).

13. Procedures for safe conduct of the work.

14. Protection of property to remain.

15. Coordination with other work.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

1.2 DESCRIPTION OF WORK

A. The extent of the demolition and removal work is indicated on the Drawings and as specified herein, and includes the demolition of designated existing construction, equipment, fixtures and cabinetry; protection of materials for re-use; construction of temporary partitions; disconnection, capping and identification of utility services; removal and disposal of debris; and protection of property to remain.

1.3 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

1. Submit a demolition and removal plan for approval before work begins. Include procedures for careful removal and disposition of the materials specified to be salvaged, disconnection schedule for utility services, coordination with other work, and a detailed description of methods and equipment to be used for each, and the sequence of operation.

1.4 REQUIREMENTS

A. Conform to Section 01560 - Environmental Protection and applicable codes and regulations of authorities having jurisdiction for demolition, removal and disposal.

B. Obtain written clearances from all public and private utility companies and agencies serving the Project Site prior to the start of any demolition work. Request that each utility agency mark the location of their utility service.

C. Obtain all required government Permits.

D. Conform to applicable regulatory procedures if hazardous, toxic or contaminated materials are encountered. Immediately notify the Owner=s representative, in writing.

E. Conduct demolition to minimize impact on existing and adjacent structures. Protect existing structures, utilities, and other items of properties to remain from damage during demolition and removal operations.

F. Minimize interference with adjacent building occupancies.

G. Immediately cease operations if adjacent structures appear to be in danger, and take appropriate corrective measures to ensure safety of the structures and occupancies.

1.5 PROJECT CONDITIONS

A. Provide, erect, and maintain temporary shoring, dust barriers, and security and protection barriers.

B. Conduct demolition to minimize interference with adjacent building

areas. C. Maintain protected access and egress at all times.

D. The use of explosives will not be permitted.

PART 2 RODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that measurements, surfaces, materials, substrates and conditions are as indicated.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section, Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Construct and maintain weatherproof closures for unprotected existing openings.

B. Construct and maintain temporary partitions or barriers to prevent the spread of dust, fumes, noise and smoke to adjacent occupied facilities.

C. Protect existing work not indicated to be altered or

removed. D. Provide bracing and shoring as required for work to

remain.

E. Disconnect, remove and cap designated utility services within the demolition area. Mark the location of disconnected utilities. Identify and indicate the capped locations on the Project Record Documents.

3.3 REMOVAL

A. Do not begin demolition until authorization has been received from the Owner=s representative.

B. Notify the Owner=s representative, in writing, ten (10) working days prior to commencement of the work.

C. Construct demolition in an orderly and careful manner. Protect existing construction to remain.

D. Where indicated, remove foundation walls and footings to the dept below finished grade, as shown.

E. Remove concrete curbs, walks and asphalt paving on grade. Backfill, rough grade and compact areas affected by the demolition.

F. Dust and Noise Control:

1. Dust resulting from the demolition shall be controlled to prevent the spread to occupied portions of the area, and to avoid creation of a nuisance in surrounding areas. The use of water will not be permitted when it will result in, or create hazardous, objectionable conditions, flooding or pollution.

2. Noise associated with the demolition shall be minimized by the selection and useof the proper equipment, procedures implemented, time of day, or day of the week the work is to be accomplished, to minimize the adverse effects of noise from operations and activities of the Contractor.

G. Existing Work: Protect existing work which is to remain in place, be reused, or remain the property of the Owner. Repair items, which are to remain but are damaged during performance of the work, to their original or better condition or replace with new. Provide new supports and reinforcements to existing construction weakened by the demolition and removal work. Repairs, reinforcements and structural replacements must be approved by the Owner=s representative.

H. Relocations: Perform removal and reinstallation of relocated items, as indicated, with workmen skilled in the trades involved. Coordinate with the agency that has jurisdiction over a utility to be relocated. Repair items to be relocated, which are damaged or replace damaged items with new undamaged items, as approved by the Owner=s
representative.

I. Ownership of Materials: Except where specified in other Sections, all material and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from the Project Site. The ownership of materials resulting from demolition, and materials and equipment removed, is vested in the Contractor upon approval of the Contractor=s demolition and removal plan and procedures, and authorization by the Owner=s representative. The Owner will not be responsible for the condition or loss of, or damage to, such property after the Contract award. Prospective purchasers shall not be allowed on the Project Site to view materials and equipment to be sold by the Contractor.

J. Salvage: The Contractor shall remove existing facilities, as necessary or as indicated; salvage usable materials as directed; store, transport, stockpile and / or protect materials at the location designated. All salvaged materials shall remain the property of the Owner.

K. Disposition:

1. Refuse resulting from demolition operations shall be hauled to an approved disposal site(s) or landfill and shall be disposed of in a manner to meet all applicable federal and local requirements, regulations and laws regarding environmental protection, health, safety and public welfare.

2. Remove rubbish and debris from the Project Site daily. Do not allow accumulation inside or outside the building. Store materials that cannot be removed daily in areas designated by the Owner=s representative.

3. Materials shall not be left on the Project Site, moved to adjoining properties or areas, or be buried on-site.

4. Refuse may not be burned on the Project Site.

5. Remove and promptly dispose of contaminated, vermin infested, and dangerous materials encountered.

L. Restore damaged surfaces, equipment and fixtures to their condition prior to beginning the work, with the same type materials, size and finish as the existing. Damage to existing facilities, structures, utilities or other work to remain shall be repaired by the Contractor using materials equal to or better than those existing, and at the Contractor=s expense.

3.4 CLEANUP

1. Upon completion of demolition and removal operations, the entire area shall be cleaned of all debris and rubbish in a manner satisfactory to the Owner=s representative.

2. Leave the areas of work in a broom clean condition.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rough hardware.

2. Miscellaneous framing and supports.

3. Loose bearing and leveling plates

4. Counters and equipment supports.

5. Miscellaneous steel trim.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 09900 - Painting: Metal finishes.

2. Products Furnished But Not Installed Under this Section: Inserts and anchors preset in masonry and concrete for anchorage of metal work.

1.2 DESCRIPTION OF WORK

A. The extent of metal fabrications is indicated on the Drawings, schedules and as specified herein, and includes providing, fabricating and installing items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not structural steel or other metal systems specified elsewhere herein.

B. All miscellaneous metal work not specified under another Section, but required for the work shall be provided under this Section whether or not specifically referred to herein.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel for Buildings.

C. American National Standards Institute (ANSI):

1. ANSI B18.5 - Round Head Bolts (Inch Series).

2. ANSI B18.6.1 - Wood Screws (Inch Series).

D American Society of Civil Engineers (ASCE):

1. ASCE / SEI 7 - Minimum Design Loads for Buildings and Other Structures.

E. American Society for Testing and Materials (ASTM):

1. ASTM A 27 / A 27M - Specification for Steel Castings, Carbon, for General Application.

2. ASTM A 47 / A 47M - Specification for Ferritic Malleable Iron Castings.

3. ASTM A 48 / A 48M - Specification for Gray Iron Castings.

4. ASTM A 36 / A 36M - Specification for Carbon Structural Steel.

5. ASTM A 53 / A 53M - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

6. ASTM A 123 / A 123M - Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

7. ASTM A 134 - Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over).

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

9. ASTM A 167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

10. ASTM A 176 - Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.

11. ASTM A 276 - Specification for Stainless Steel Bars and Shapes.

12. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

13. ASTM A 500 / A 500M - Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

14. ASTM A 501 - Specification for Hot-Formed *Welded* and Seamless Carbon Steel Structural Tubing.

15. ASTM A 568 / A 568M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

16. ASTM A 653 / A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

17. ASTM A 780 - Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

18. ASTM C 1107 / C 1107M - Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

19. ASTM E 330 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

20. ASTM E 935 - Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

21. ASTM E 936 - Practice for Roof System Assemblies Employing Steel Deck, Preformed Roof Insulation, and Bituminous Built-Up Roofing.

F. American Welding Society (AWS):

1. AWS D1.1 / D1.1M - Structural Welding Code - Steel.

G. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

H. International Code Council:

1. International Building Code (IBC), 2009.

I. National Association of Architectural Metal Manufacturers (NAAMM):

1. Metal Finishes Manual for Architectural and Metal Products.

2. MBG 531 - Metal Bar Grating Manual.

3. MBG 532 - Heavy Duty Metal Bar Grating Manual.

4. MBG 533 - Welding Specification for Fabrication of Steel, Aluminum and Stainless Steel Bar Grating.

J. SSPC: The Society for Protective Coatings (formerly Structural Steel Painting Council):

1. SSPC Painting Manual.

2. SSPC PA 1 - Specification Procedure for Shop, Field and Maintenance Painting of Steel.

3. Paint 20 - Specification of Zinc-Rich Coating Type 1 - Inorganic and Type II - Organic.

4. SSPC SP 2 - Requirements for Hand Tool Cleaning of Steel Surfaces.

5. SSPC SP 3 - Requirements for Power Tool Cleaning of Steel Surfaces.

6. SSPC SP 6 - Standard for Commercial Blast Cleaning of Steel Surfaces.

7. SSPC SP 7 - Standard for Brush-Off Blast Cleaning of Steel Surfaces.

8. VIS 3 - Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand-Tool Cleaning.

1.4 DEFINITIONS

A. Custom Metal Fabrications: Metal fabrications custom built for a specific Project purpose.

B. Pre-Manufactured Metal Fabrications: Metal fabrications which are factory-fabricated for a specific architectural purpose. These products may require modification to meet the Project requirements, but their primary manufactured purpose is not altered.

C. Non-Structural Metal Fabrications: Metal work which has not been designed by the Project Structural Engineer, and which is not part of the Structural Engineer's documents.

1.5 SYSTEM PERFORMANCE

A. Structural Performance: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1.6 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's specifications, anchor details and installation instructions for pre-manufactured products. Submit data indicting materials used in miscellaneous metal fabrications, including paint products and grout.

2. Shop Drawings:

a. Drawings for fabrication and erection of miscellaneous metal fabrications; including plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installations by others.

b. Where materials or fabrications are required to comply with requirements for design loadings, include structural computations, materials properties and other information for structural analysis. Prepare under the seal of a professional structural engineer for products requiring structural engineering to meet the Performance Requirements.

c. Include profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories, erection drawings, elevations, welded connections using standard AWS welding symbols with net weld lengths.

d. Take field measurements prior to the preparation of Shop Drawings and prefabrication when possible. Allow for trimming and fitting where taking of field measurements before fabrication might delay construction.

3. Samples:

a. Submit representative samples of materials and finished products as requested by the Architect.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator: Company specializing in fabricating the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Performance Requirements: Provide the capacity to withstand the following loading requirements for exterior units as defined in IBC 2009 Chapter 16:

1. Seismic Loads: According to IBC 2009, Section 1613 and ASCE 7

a. Seismic Design Category: D

b. Seismic Importance Factor: Per ASCE 7

2. Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

a. Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 pounds per square foot, or a concentrated load of 300 pounds so locates as to produce maximum stress conditions.

C. Take field measurements prior to the preparation of Shop Drawings and fabrication, where possible. Do not delay the construction. Allow for trimming and fitting when the taking of field measurements before fabrication might delay the work.

D. Pre-assemble items in the shop to the greatest extent possible, to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and a coordinated installation.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Protect materials from corrosion, deformation and other damage during delivery, storage and handling.

C. Deliver product to the Project Site in the fabricator's original, unopened packages, containers or bundles.

D. Store and protect the materials with a weatherproof covering; ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness for fabrication of miscellaneous metal work which will be exposed to view.

B. Steel Plates, Angles, and Other Structural Shapes: ASTM A 36 / A 36M.

C. Steel Pipe: ASTM A 53 / A 53M. Type and grade (if applicable), as selected by the

fabricator and as required for the design loading. Black finish, unless galvanizing is indicated. Standard weight (Schedule 40), unless otherwise indicated.

D. Galvanized Steel Pipe and Tube: ASTM A 53 / A 53M.

E. Steel Tubing: Cold-formed, ASTM A 500 / A 500M or hot-rolled, ASTM A 501.

F. Sheet Steel, Galvanized: ASTM A 123 / A 123M.

G. Sheet and Strip Steel, Hot-Rolled: ASTM A 568 / A 568M.

H. Structural Steel Sheet: Hot-rolled, ASTM A 134 or cold-rolled ASTM E 936, Class 1; of grade required for the design loading.

I. Galvanized Structural Steel Sheet: ASTM A 653 / A 653M, of grade required for the design loading. Coating designation as indicated, or if not indicated, G90.

J. Stainless Steel: AISI Type 304 for fumed and welded products. ASTM A 276 for base shapes and forging; ASTM A 167 or A 176 as best suited for plates, sheets and strip. Satin finish typical.

K. Gray Iron Castings: ASTM A 48, Class 30.

L. Malleable Iron Castings: ASTM A 47, grade as selected by the fabricator.

M. Steel Bar Grating: ASTM A 36 / A 36M or NAAMM MBG 531.

N. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as the supported fabrications.

O. Concrete Inserts. Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims, as required, hot-dip galvanized, ASTM A 153.

P. Non-Shrink, Non-Metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C 1107 (formerly CE CRD-C621). POR-ROK Anchoring Cement by Minwax Co. division of Eastman Kodak Co., or approved equal. Comply with the manufacturer's printed instructions.

Q. Welding Materials: AWS D1.1 / D1.1M. Type required for the materials being welded.

R. Anchors:

1. Threaded Type, Concrete Inserts: Galvanized malleable iron or cast steel capable of receiving 3/4" diameter machine bolts.

2. Slotted Type, Concrete Inserts: Welded box type, fabricated with a minimum 1/8" thick galvanized pressed steel plate with slots to receive 3/4" diameter square head bolts, and knockout cover.

3. Expansion Shield, Masonry Anchorage: FS FF-2-325.

4. Toggle Bolts: FS FF-B-588, type, class and style as required.

S. Fasteners:

1. Provide zinc-coated fasteners for exterior use or where built into exterior walls, Select fasteners for the type, grade and class required.
2. Bolts, Nuts and Washers at Interior Locations: ASTM A 307, Grade A, regular hexagon head.
3. Bolts, Nuts and Washers at Exterior Locations: ASTM A 307, galvanized per ASTM A 153.
4. Bolts, Round Head: ANSI B18.5.
5. Lag Bolts: Square head type, FS FF-B-561.
6. Plain Washers: Round, carbon steel, FS FF-W-92.
7. Lock Washers: Helical spring type, carbon steel, FS FF-W-84.
8. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
9. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
10. Machine Screws: Cadmium plated steel, FS FF-S-92.
11. Wood Screws: Flat head carbon steel, FS FF-S-111.

T. Paint:

1. Primer for Field Painting: Provide one of the following:

    a. No. 99 Red Primer by Tnemec Co.

    b. Ceco No. 15 Primox by Chessman-Elliot Company.

    c. No. 7-C-19 by Rowe Products, Inc.

2. Touch-Up Primer for Galvanized Surfaces: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with SSPC-Paint-20 and ASTM A 780.
3. Section 01600 - Product Requirements: Product options and substitutions: Substitutions: Permitted.

U. Concrete Fill:

1. Concrete Materials and Properties: Comply with the requirements of Division 3 Sections for normal weight, ready-mix concrete with minimum 28-day compressive strength of 4,000 psi, 440 pounds cement per cubic yard, minimum, and a W/C ration of 0.65, maximum, unless higher strength is indicated.
2. Non-Slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rust-proof and non-glazing; unaffected by moisture and cleaning materials.

2.2 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Sections of Division 6.

B. Fabricate items to the sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.3 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for the applications indicated, or which are not a part of the structural steel framework, as required to complete the work.

B. Fabricate miscellaneous units to the sizes, shapes, and profiles indicated or, if not indicated, of the required dimensions to receive adjacent other construction retained by framing and supports. Except as otherwise indicated, fabricate from structural steel shapes, plates, and steel bars, of welded construction using mitered joints for field connections. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry.

2. Furnish inserts if units must be installed after concrete has been placed.

3. Except as otherwise indicated, space anchors and inserts 16" o.c., and provide the minimum number of anchor units in the form of steel straps 1-1/4" wide x 8" long.

2.4 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on concrete or masonry construction, made flat, free from warp and twist, and of the required thickness and bearing area. Drill plats to receive anchor bolts and for grouting, as required. Galvanize after fabrication.

2.5 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for the profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for the coordination of assembly and installation with other work.

B. Hot-dip galvanize miscellaneous framing and supports in exterior locations and where indicated.

2.6 SHELF AND RELIEVING ANGLES

A. Provide structural steel shelf and relieving angles of the sizes indicated for attachment to concrete farming. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from the ends and at not more than 24" o.c., unless otherwise indicated.

B. Hot-dip galvanize shelf angles to be installed on exterior concrete framing.

C. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf and angles to cast-in-place concrete.

2.7 FABRICATION

A. Fabricate steel items according to the approved Shop Drawings and to the applicable portions of AISC Specifications.

B. Pre-assemble products in the shop to the greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assemble and installation.

C. For fabrications exposed to view, use materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, roller trade names and roughness. Remove blemishes by grinding or by welding and grinding prior to cleaning, treating and the application of surface finishes, including zinc coating.

D. Workmanship: Use materials of the size and thickness indicated or, if not indicated, as required to produce the strength and durability in the finished products for the intended use. Work to the dimensions indicated or accepted on the Shop Drawings, using provendetails of fabrication and support. Use the type of materials indicated or specified.

E. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Fabricate items with joints tightly fitted and secured. Make exposed joints butt tight, flush and hairline. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to the smallest radius possible, without causing grain separation or otherwise impairing the work.

F. Conceal welds where possible. Weld corners and seams continuously, complying with AWS and the Building Code. At exposed connections, grind the exposed welds smooth and flush to match and blend with the adjoining surfaces.

G. Form exposed connections with hairline joints, flush and smooth using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, Phillips flat-head (countersunk) screws, or bolts.

H. Exposed Mechanical Fastenings: Flush countersunk screws and bolts, unobtrusively located, except where specifically noted otherwise; consistent with the design.

I. Provide anchorage of the type indicated, coordinated with the supporting structure. Fabricate and space anchoring devices to provide adequate support for the intended use. Fabricate anchorage and related components of the same material and finish as the metal fabrication, unless indicated otherwise.

J. Cut, reinforce, drill and tap miscellaneous metal work, as indicated, to receive the finish hardware and similar items.

K. Fabricate joints which will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

L. Galvanizing: For items indicated to be galvanized, apply zinc-coating by the hot-dip process in compliance with the following requirements:

1. ASTM A 153 / A 153M for galvanizing iron and steel hardware.

2. ASTM A 123 / A 123M for galvanizing both fabricated and un-fabricated iron and steel products made of un-coated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299" thick and heavier.

3. ASTM A 123 / A 123M for galvanizing assembled steel products.

2.8 FINISHES, GENERAL

A. Comply with NAAMM, Metal Finishes Manual for Architectural and Metal Products, for recommendations relative to the application and designation of finishes.

B. Finish metal fabrications after assembly.

2.9 SHOP PAINTING AND PROTECTIVE COATING

A. Conform to SSPC-PA 1, including preparation for painting.

B. Apply shop primer to un-coated surfaces of metal fabrications, except those with a galvanized finish or to be embedded in concrete, masonry, or sprayed-on fireproofing, unless otherwise indicated. Comply with the requirements of SSPC-PA 1, Paint Application Standards, Guides and Specifications No. 1", for shop painting.

C. Preparation for Shop Priming: Prepare un-coated ferrous metal surfaces to comply with the minimum requirements indicated below for SSPC surface preparation specifications and the environmental exposure conditions of the installed metal fabrications:

1. Interiors (SSPC Zone 1A): SSPC-VIS 3.

2. Exteriors (SSPC Zone 1B): SSPC-SP 6.

D. Shop primer for Ferrous Metal: Fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer selected for compatibility with the substrates and with the types of alkyd-type paint systems indicated, and for compatibility to provide a sound foundation for field-applied topcoats, despite prolonged exposure; complying with the performance requirements of FS TT-P-86, Types I, II and III.

E. Hot-Dip galvanizing and zinc coatings applied on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strips shall comply with ASTM A 123 / A 123M. Galvanized surfaces, for which a shop coat of paint is specified, shall be chemically treated to provide a bond for the paint. Except for bolts and nuts, all galvanizing shall be done after fabrication.

F. Clean surfaces of rust, scale, grease and foreign matter in accordance with SSPC-SP 1 Solvent Cleaning, prior to finishing. Prepare surfaces for painting in accordance with SSPC-SP 2, SSPC-VIS 3 or SSPC-SP 7.

G. Do not prime surfaces that will be in direct contact with concrete, or where field welding is required.

H. Prime paint items scheduled, with one coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for the installation of anchorages, such as concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors to be embedded in concrete or masonry.

B. Coordinate the delivery of such items to the Project Site.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners, wherenecessary, for securing miscellaneous metal fabrications to in-place construction, including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors, as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for the installation of miscellaneous metal fabrications. Set fabrications accurately in location, alignment, and elevation with edges and surfaces level, plumb, true, and free of rack; measured from established lines and levels.

C. Setting Loose Plates: Clean concrete or masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to the surfaces. Clean the bottom surface of bearing plates.

D. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned an plumbed, tighten the anchor bolts. Do not remove the wedges or shims, but if protruding , cut-of flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic, non-shrink grout in exposed locations, unless otherwise indicated. Pack grout solidly between bearing surfaces and pates to ensure that no voids
remain.

E. Provide temporary bracing or anchors in the formwork for items to be built into concrete, masonry or similar construction.

F. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joins smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

H. Metal Bar Gratings:

1. Comply with the recommendations of NAAMM, "Metal Bar Gratings Manual", for the installation of gratings, including installation clearances and standard anchoring details.

2. Secure removable units to supporting members with the type and size clips and fasteners indicated, of if not indicated, as recommended by the grating manufacturer for the type of installation conditions shown.

3. Secure non-removable units to supporting members by welding where both materials are the same, otherwise fasten by bolting, as indicated.

I. Field Welding: Comply with the AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of the welds made and methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion-resistance of the base metal.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and the contour of the welded surface matches the adjacent surfaces.

J. Touch-Up For Galvanized Surfaces: Clean the welds, bolted connections and abraded areas, and apply two (2) coats of galvanizing repair paint in compliance with SSPC Paint 20 and ASTM A 780.

K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting; comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.

1. Apply by brush or spray and provide a minimum dry film thickness of 2.0 mils.

3.4. ISOLATION REQUIREMENTS

A. Dissimilar Metals:

1. Where metal surfaces are in contact with, or fastened to dissimilar metals except stainless steel, zinc or zinc coating, the metal shall be protected from the dissimilar metal.

2. Where drainage from a dissimilar metal passes over the metal, paint the dissimilar metal with a non-lead pigmented paint.

B. Cementitious Materials: Paint metal where in contact with mortar, concrete, masonry or other cementitious material, with an alkali-resistant coating such as heavy-bodied bituminous paint or epoxy paint.

C. Wood Contact: Isolate metal from cedar, redwood, oak and acid-treated lumber by means of unbroken 6-mil polyethylene construction sheet or a heavy coating of metal-protective paint.

D. Surfaces in contact with sealants after installation need not be coated with any type of protective material.

3.5 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect fabrications and installations for alignment, attachment to the structure, and secure and rigid installation.

3.6 ADJUSTING AND CLEANING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.
3. Slotted channel framing.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

C. Samples for Verification: For each type and finish of extruded.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Mill Certificates: Signed by aluminum manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.

C. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

D. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum.
2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ASTM F738M); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy [**Group 1 (A1)**] [**Group 2 (A4)**].

D. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Alloy **Group 1 (A1)** stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with **Section 099123 "Interior Painting."**

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.7 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.8 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.9 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with ANSI/AISC 360, "Specifications for Structural Steel Buildings," and with requirements applicable to listing and labeling for fire-resistance rating indicated.

3.4 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous wood blocking, supports and rough-in.

2. Plywood.

3. Anchors and connectors.

4. Preservative and fire-resistive treatment.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section - 03300 - Cast-In-Place Concrete: Substrate for attachment.

2. Section - 04230 - Reinforced Unit Masonry: Substrate for attachment.

3. Section 06400 - Architectural Woodwork: Finish work to be secured.

4. Section 09110 - Non-Load Bearing Steel Framing: Substrate for attachment.

D. Work furnished under other Sections but installed in whole, or in part under this Section:

1. Section 05500 - Metal Fabrications.

1.2 DESCRIPTION OF WORK

A. The extent of the rough carpentry work is indicated on the Drawings and as specified herein, and includes providing and installing wood framing and construction, anchors and connectors, miscellaneous blocking, supports and wood rough-in as required by the Project conditions.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Lumber Standards Committee (ALSC):

1. Softwood Lumber Standards.

C. American Plywood Association (APA):

1. Grades and Standards.

D. American Society of Civil Engineers (ASCE):

1. ASCE / SEI 7 - Minimum Design Loads for Buildings and Other Facilities.

E. American Society for Testing and Materials (ASTM):

1. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

2. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

F. American Wood Preservers Association(AWPA):

1. AWPA - C1 - All Timber Products - Preservative Treatment by Pressure Process.

2. AWPA - C15 - Wood for Commercial-Residential Construction Preservative Treatment by Pressure Processes.

3. AWPA - C20 - Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

4. AWPA - C27 - Plywood - Fire-Retardant Treatment by Pressure Processes.

5. AWPA - P5 - Water Borne Preservatives.

G. International Code Council:

1. International Building Code (IBC):

H. Underwriters' Laboratories, Inc. (UL):

1. UL FR S - Fire-Rated Treated Wood with Flame Spread and Smoke Developed Ratings of 25 or less in accordance with ASTM E 84.
2. UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Section 01300 - Submittal Procedures: Procedures for submittals.

1. Shop Drawings: Dimensioned plans, elevations, sections, large scale details, attachment devices, anchors and other components.

2. Assurance / Control Submittals:

a. Wood Treatment: Treatment manufacturer's instructions for the proper use of each type of treated material.

b. Certificates:

1) Pressure Treatment and Termite Treatment: Certification from the treating plant identifying the chemicals and process used, net

amount of preservative retained; conformance with applicable standards.

2) Water-borne Preservatives: Certification from the treating plant stating that the moisture content of treated materials was reduced to a maximum of fifteen percent (15%) prior to shipment to the Project Site.

3) Fire Retardant Treatment: Certification from the treating plant stating that the type of chemicals used and the fire performance characteristics achieved; that the fire-retardant treatment materials comply with the governing code, ordinances and requirements of local authorities having jurisdiction; that treatment will not bleed through finished surfaces.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.

2. Plywood Grading Agency: Certified by APA.

B. Regulatory Requirements: Conform to the applicable codes for fire-retardant treatment of wood surfaces for flame / smoke ratings.

C. Performance Requirements: Provide the capacity to withstand the following loading requirements as defined in IBC 2009 Chapter 16:

1. Seismic Loads: According to IBC 2009, Section 1613 and ASCE 7

a. Seismic Design Category: D

b. Seismic Importance Factor: Per ASCE 7

D. Evidence of Grade:

1. Stamp each piece of lumber and plywood with a grade mark and trademark of the Association having jurisdiction, or accompany each shipment with an official certificate of inspection. Stamp on concealed surfaces or surfaces scheduled for opaque paint finish..

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

1. Inspect wood materials for conformance with the specified grades, species and treatment at the time of delivery to the Project Site.

2. Reject and return unsatisfactory wood materials.

B. Provide facilities for the handling and storage of materials to prevent damage to edges, ends and surfaces.

C. Keep materials dry. Stack materials off the ground a minimum of 12“ or, if on a concrete slab-on-grade, a minimum of 1-1/2"; fully protected from the weather. Provide for air circulation within and around stacks, and under temporary coverings.

D. For materials pressure treated with waterborne chemicals, place spacers between each bundle to provide for air circulation.

PART 2 PRODUCTS

2.1 FRAMING LUMBER

A. General:

1. Use Douglas Fir or Southern Pine where concealed; Redwood where exposed.

2. Pressure and termite treated.

3. Sizes shown are nominal. Actual sizes shall conform to American Lumber Standard, PS 20-70.

4. Dimensioned lumber shall be S4S to standard dimensions.

5. Moisture content shall be fifteen percent (15%) or less, unless otherwise noted.

6. All lumber shall bear the grade mark of Western Wood Products Association (WWPA) standard grading rules, latest edition. Grades called out below are minimum. Use appearance grade where exposed to view.

B. Non-Load Bearing, Blocking, Bridging and Miscellaneous Framing: Standard Grade, Table 1.

C. Load-Bearing and Non-Load Bearing Studs (8' long or less), Related Plates and Sills: No. 2 Grade, Table 3.

D. Boards: Construction Grade.

2.2 NAILERS, BLOCKING, FURRING AND SLEEPERS

A. Wood for nailers, blocking, furring and sleepers: Construction grade, finished 4 sides, 15 percent maximum moisture content. Pressure preservative treat items in contact with roofing, flashing, waterproofing, concrete, masonry or the ground.

2.3 PLYWOOD

A General: Grading Rules in accordance with American Plywood Association (APA), Plywood Specification & Grade Guide, 1978 edition. All plywood with pressure and termite treatment shall bear appropriate grade trademark of the APA.

B. Plywood Backing Plates (for mounting electrical and telephone equipment): Fire-retardant treated panels with grade designation, APA C-D PLUGGED INT; exterior glue, in thickness indicated, or if not indicated, not less than ½".

2.6 ROUGH HARDWARE

A. All necessary hardware for installation of the work specified herein, of the sizes and quantities required by Building Code or herein after specified. Hardware shall be hot-dip galvanized steel or approved type of non-ferrous metal.

2.7 FRAMING CONNECTORS AND ACCESSORIES

A. Provide connectors and accessories where indicated or as required by conditions; zinc-coated steel, Code approved, as manufactured by Simpson Company, Silver Metal Products, Inc., or as approved. If a specific type is not shown, use type recommended by the connector manufacturer for the conditions of installation. Secure with nails, screws, or bolts provided or recommended by the manufacturer.

2.8 CONSTRUCTION ADHESIVE

A. Conform to APA performance specification AFG-01 and specific application recommendations of the manufacturer.

B. Products as manufactured by Bostik, Inc., Henkel, Sovereign Specialty Chemicals, Inc. or approved equal.

2.9 FASTENERS

A. General: Hot-dip galvanized steel, typical.

1. Nails and Staples: Federal Spec FF-N-105B.

2. Bolts: Federal Spec FF-B-575.

3. Nuts: Federal Spec FF-N-836.

4. Lag Screws and Bolts: Federal Spec FF-B-561.

5. Toggle Bolts: Federal Spec FF-B-588.

6. Wood Screws: Federal Spec FF-S-111.

7. Expansion Shields: Federal Spec FF-S-325.

B. Fasteners:

1. Bolts, Nuts, Lag Screws, Wood Screws and Washers: ASTM A 307, medium carbon steel; size and type to suit the application, unless otherwise noted.

2. Expansion Shield Fasteners: For anchorage of non-structural items to solid concrete and masonry.

3. Powder or Pneumatically Activated Fasteners: For anchorage of non-structural items to steel.

4. Fasteners for Non-Structural Wood Members to Masonry: 1/4" diameter x 3-1/4", Phillips, flat head.

C. Provide necessary installation of the work required; sizes and quantities of fasteners noted herein or as required by Code.

D. Tools: Provide the manufacturers recommended power tool for installing each type of fastener.

2.10 WO D TREATMENT

A. General:

1. Treatment material shall provide protection against termites and fungal decay and shall be approved for use as a wood preservative for its intended use by the U. S. Environmental Protection Agency.

2. For all lumber and plywood above the ground and in ground contact, comply with the applicable requirements of AWPA, Standards C2 for Lumber, C9 for Plywood and of the AWPB standards referenced below.

3. Treated material shall meet the interior Type A requirements in AWPA, Standard C-20 for lumber and C-27 for plywood.

4. Pressure treat above ground items with water-borne preservatives complying with AWPA LP-2.

5. After treatment, kiln dry to a maximum moisture content of fifteen percent (15%).

6. Mark each treated item with AWPB Quality Mark Requirements.

7. Chemicals used to treat materials shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

B. Wood Requiring Treatment:

1. Lumber, Preservative Treated: All interior and exterior wood including nailers, blocking, stripping and similar items in conjunction with roofing, flashing and other construction; sills, blocking, furring, stripping, ledgers, supports and similar items in contact with concrete or masonry.

2. Lumber, Fire-Retardant Treated: Interior framing, blocking, furring, stripping, ledgers, supports, nailers, and miscellaneous exposed wood. Do not use fire-treated wood in contact with concrete or masonry.

3. Interior Plywood, Fire-Retardant Treated: Plywood backing for electrical and telephone equipment.

C. Preservative Pressure Treated Lumber:

1. Products:

a. Ammoniacal Copper Zinc Arsenate (ACZA).

b. Chromated Copper Arsenate (CCA).

c. Fluor Chrome Arsenate Phenol (FCAP).

d. Pentachlorophenol (Penta).

2. Comply with EPA and OSHA requirements and regulation and in accordance with AWPA, P-9. Type C treatment shall not discolor the wood used for exposed finish.

3. Incising is not permitted for appearance grade lumber or where materials are exposed to view.

4. Impregnate lumber with a preservative treatment conforming to AWPA, Standard C1 and P5. Apply preservative in a closed cylinder by the pressure process in accordance with AWPA, Standard C15.

5. Retention of dry salts:

a. Moderate service conditions (weather exposure): 0.25 pounds per cubic foot (oxide basis).

b. Severe conditions (constant contact with the ground or water): 0.40 pounds per cubic foot (oxide basis).

6. Remove excess moisture where shrinkage is a serious fault and where treated lumber will be in contact with concrete, masonry or plaster, and where water-borne treated lumber is to be painted or stained.

7. Lumber to be painted or stained shall have knots and pitch streaks sealed the same as for untreated wood.

8. Liberally brush freshly cut surfaces, bolt holes and machined areas with the same preservative, in accordance with AWPA, Standard M4.

D. Fire-Retardant Treatment:

1. Where fire-retardant lumber or plywood is specified, otherwise indicated or required by the Building Code, provide materials which comply with AWPA standards for pressure impregnation. Use fire-retardant chemicals which have a flame spread rating of not more than 25 when tested in accordance with UL Test 723 or ASTM E 84, and show no increase in flame spread and significant progressive combustion upon continuation of the test for an additional twenty (20) minutes.

2. Where treated items are exposed at the exterior or high humidities or are to have a transparent finish, provide appearance grade materials which show no change in fire hazard classification when subjected to standard rain test UL 790 or ASTM B 2898.

3. Use fire-retardant treatment which will not bleed through or adversely affect the type of finish indicated and which does not require brush treatment of field made cuts to maintain the fire hazard classification.

4. Where transparent finish is indicated, use the type of treatment and species which permits milling of the lumber after treatment without altering the indicated fire hazard classification, as determined by fire testing.

5. Kiln dry treated items to a moisture content of fifteen percent (15%), maximum.

6. Provide UL label on each piece of fire-retardant lumber and plywood.

7. Inspect each piece of treated lumber and plywood after drying. Discard damaged and defective pieces.

8. Products:

   a. "Dricon" by Arch Wood Protection.

   b. "Pyro-Guard" by Hoover Treated Wood Products.

   c. Section 01600 - Product Requirements: Product options and substitutions. Substitutions: Permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that spacing, direction and details of supports are correct to accommodate the installation of blocking, backing, stripping, furring and nailing strips.

2. Verify that surfaces to receive work are rigid, secure, accurately sized and located and otherwise properly prepared.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Fit carpentry work to other work. Scribe and cope as required for accurate fit.

B. Coordinate the location of furring, nailers, blocking, grounds and similar supports to allow for the proper attachment of other work.

3.3 GENERAL

A. Field Measurements:

1. Verify field measurements prior to fabrication.

2. If field measurements differ slightly from Drawing dimensions, modify the work as required for accurate fit.

3. If measurements differ substantially, notify the Owner's representative prior to fabrication.

B. Workmanship:

1. Carefully layout, cut, fit and install rough carpentry items.

2. Use sufficient number of nails, spikes, screws and bolts to insure rigidity and permanence.

3. Drive nails perpendicular to the grain of wood in lieu of toenailing, where feasible.

4. Provide for installation and support of plumbing, air conditioning and ventilation work.

5. Install work true to lines, plumb and level, unless indicated or required otherwise.

C. Installation:

1. Install proprietary products in accordance with the manufacturer's directions.

2. Provide washers under nuts and heads when making bolted or lag screwed connections.

3. Except as otherwise specified herein, machine nail or staple with written approval only.

4. Install framing connectors where indicated; secure with fasteners recommended by the manufacturer.

D. Protecting Other Work and Existing Facilities: Protect against damage and discoloration caused by the work of this Section.

3.4 PLATES

A. Provide single plates at floors and bottoms of openings; double plates face nailed together at ceilings and heads of openings.

B. Provide headers, as specified herein, over openings more than 2'-6" wide.

C. Splice single plates; stagger ends of double plates at least 48"; splice plates abutting corners. Locate plate splices directly over studs.

D. Unless shown otherwise on the Drawings, anchor plates resting on concrete or masonry with 1/2" diameter bolts at 48" o.c., maximum, or as required by windload.

3.5 SITE TREATMENT OF WOOD MATERIALS

A. Apply preservative treatment in accordance with the manufacturer's published instructions.

B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings.

C. Treat site-sawn cuts.

D. Allow preservative to dry prior to erecting members.

3.6 CONSTRUCTION

A. Site Tolerances: Framing Members: 1/4" from true position, maximum.

END OF SECTION

SECTION 06400

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic laminate faced casework and shelving.

2. Solid polymer fabrications.

3. Preparation for installation and connection of utilities.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

2. Section 06100 - Rough Carpentry: Blocking and backing plates in walls for anchorage.

2. Section 06200 - Finish Carpentry: Adjustable shelving.

4. Section 09110 - Non-Load Bearing Steel Framing: Blocking and backing plates.

5. Section 09900 - Painting: Woodwork finishes.

6. DIVISIONS 15 and 16: Service fittings and connections.

1.2 DESCRIPTION OF WORK

A. The extent of architectural woodwork is indicated on the Drawings and as specified herein, and includes providing, fabricating and installing all wood faced and plastic laminate faced architectural woodwork, trim and countertops, wood shelving, installations and utility connections.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American National Standards Institute (ANSI):

1. ANSI A135.4 - Basic Hardboard.

2. ANSI A208.1 - Mat Formed Wood Particleboard.

C. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Building and Facilities.

2. Accessibility Guidelines for Schools.

D. Architectural Woodwork Institute (AWI):

1. AWI AWQS - Architectural Woodwork Quality Standards, 6th Edition,

[Premium] [Custom] Grade, except as otherwise indicated.

E. National Electric Manufacturer's Association (NEMA):

1. NEMA LD3 - High Pressure Decorative Laminates.

F. United States Department of Commerce Product Standard (PS):

1. PS 1 - Construction and Industrial Plywood.

2. PS 20 - American Softwood Lumber Standard.

1.4 DESIGN INTENT

A. It is the design intent that similar woodwork throughout the Project match. Coordinate work between the separate installers providing similar woodwork to ensure that the design intent is achieved to the satisfaction of the Owner's representative.

1.5 DEFINITIONS

A. Exposed Surfaces: The exposed portions of woodwork, including surfaces visible when doors and drawers are closed. Bottoms of woodwork more than 4'-0" above the floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed. The front and both sides of all storage cabinets shall be considered as exposed, even when one or both side panels are against a wall or an adjacent cabinet.

B. Semi-exposed Surfaces: Semi-exposed portions of woodwork includes members behind opaque doors, such as shelves, dividers, interior face of ends, wood back, drawer sides, backs and bottoms, and the inside face of doors. Tops of woodwork 6'-6" or more above the floor shall be considered as semi-exposed.

C. Unexposed Surfaces: Unexposed portions of woodwork includes sleepers, web frames, dust panels and other surfaces not usually visible after installation.

1.6 SUBMITTALS

A. Section 01300 - Submittal Procedures: Procedures for submittals.

1. Product Data: Fabricator's specifications and installation instructions for each item of factory-fabricated woodwork, wood veneer counter tops, finish hardware and finish coating products.

a. Wood veneers and finishes.

b. Data for hardware and accessories indicating the material, type, function, attachment and finish.

2. Shop Drawings: Show the location of each item on dimensioned plans, sections, elevations, and large scale details. Indicate materials used, wood species, component profiles, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes. Submit for the following:

   a. Cabinet work, base and overhead.

   b. Counter work, base and overhead.

   c. Shelving units.

   d. Submit fabricators product information including Shop Drawings for fabricator's standard units.

3. Samples: For each species and cut or pattern of architectural woodwork:

   a. General:

      1). Two 12" x 12" solid wood and plywood or hard board samples with factory-applied transparent or opaque finish for each finish system and color required.

      2). Two samples of each countertop material.

      3). One unit of each type and finish of cabinet hardware.

   b. Initial Samples: Unless specific products are scheduled, submit 2" x 2", minimum, size samples of the complete range of colors, patterns, and finishes available for initial selection.

   c. Final Samples: matching those initially selected.

      1). Fused Joint Sample: On project products that would least likely obscure joints, submit 6" x 10" samples showing fused joint work.

4. Assurance / Control Submittals:

   a. Fabricator's certificate that the products meet or exceed the specified requirements.

   b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Contract Closeout: Procedures for closeout submittals.

   1. Warranty: Submit a written Warranty with forms completed in the name of the Owner and registered with the fabricator.

1.7 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to the delivery of architectural woodwork materials to the Site.

   1. Require attendance of the Contractor, Architect, Owner's representative, and

representatives of the installer of finish carpentry, other finishes, painting and related mechanical and electrical work.

2. Review coordination and environmental controls required for proper installation, and ambient conditions in areas to receive the work.

3. Review preparation and installation procedures, and the coordination and scheduling required with related work.

B. Support Work:

1. For support work not indicated in the Contact Documents, coordinate the requirements with other installers, in a timely manner.

2. Provide work as necessary to ensure that all work has proper framing, backing and reinforcing supports to ensure secure and solid installations.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Fabricator: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Quality Standards:

1. Woodwork shall comply with the requirements of AWI "Architectural Woodwork Quality Standards Illustrated', Eighth Edition, 200, except where more stringent requirements are specified herein.

C. Style: Fabricate, as indicated, utilizing the following:

1. Flush Overlay Construction.

2. Wood faced casework - Custom grade.

6. Countertop, casework and shelving - Custom grade.

7. Wood shelving - Custom grade.

1.9 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Package architectural woodwork in water-tight containers for transport to the Project Site to prevent damage, water damage, soiling and deterioration and for storage in a location other than inside the building, if necessary, circumstances, the woodwork must be stored in other than the installation areas, store only in areas meeting the requirements specified for the installation areas.

D. Do not deliver woodwork until wet work, grinding, painting and similar operations which could damage, soil or deteriorate the woodwork has been completed in the installation areas, and humidity has been stabilized.

E. Deliver products to the Project Site in the fabricator's original, new, unopened packaging, crates or containers.

1.10 JOB CONDITIONS

A. The fabricator of woodwork shall determine the optimum moisture content and required temperature and humidity conditions.

B. The installer shall advise the Contractor of the temperature and humidity requirements for the architectural woodwork installation areas. Do not install woodwork until the required temperature and relative humidity has been stabilized and will be maintained in the installation areas.

C. Stabilize temperature and humidity in installation areas, as necessary, to maintain the moisture content of the installed woodwork within a 1.0% tolerance of optimum, from the date of installation throughout the remainder of the construction period.

D. Unless instructed otherwise by the Installer, maintain the spaces to receive woodwork between 65° F and 80° F, with a relative humidity of 50% or less for 72 hours prior to, during and after installation until the date of Substantial Completion.

1.11 WARRANTY

A. Section 01700 - Contract Closeout: Procedures for closeout submittals.

B. Fabricator's Warranty: Provide fabricator's standard Warranty against defects in product materials and workmanship.

PART 2 PRODUCTS

2.1 PLASTIC LAMINATE FACED CASEWORK AND SHELVING

A. Core Stock: Material shall be 45 pound density hard board, industrial grade.

1. Minimum core thickness shall be 3/4" except:

a. Hidden cabinet backs may be 1/4" thick hardboard.

b. Exposed backs and drawer bottoms may be 1/4" thick.

c. Drawer sides may be 1/2" thick.

d. Backs of free standing cabinets may be 1/2", 5/8" or 3/4" thick, as indicated or required.

e. Cabinet bases (toe spaces) may be solid kiln-dried wood, unfinished for finish applications by others.

f. Shelf thickness shall be 1" for any shelf over 36" long.

2. Laminated Plastic. Where Plam is indicated for exterior cabinet finish, all visible exposed faces and edges shall be covered with laminated plastic, unless otherwise specified herein. Provide backer as necessary to balance plastic laminate installation at concealed locations.

a. Fabricators: Subject to compliance with the Project requirements, fabricators offering products which may be incorporated into the work include the following:

1). Formica Corporation.

2). Nevamar Corporation.

3). Wilsonart International.

b. High-Pressure Decorative Laminate: NEMA LD-3, GP-50, General Purpose:

1). Nominal 0.050" thick for horizontal and high usage exposures.

2). 0.028" thick for vertical and medium usage exposures.

3). 0.020" thick, liner grade, for all semi-exposed faces inside drawers, doors, backs, shelves, etc.

4). Color(s) as selected.

c. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

3. Laminated Plastic Adhesive: Type recommended by the laminated plastic manufacturer; bonded by machine application and pressure of not less than 100 pounds per square inch.

4. Edge Treatment: Top edges of drawer sides and drawer backs; edge of doors, fixed panels, visible frame parts and drawer face tops and edges shall be matching laminate faced or shall be resilient polyvinylchloride 0.024" thick, machine bonded with hot melt glue, factory edges trimmed, superfinished, buffed and polished.

2.2 SOLID POLYMER FABRICATIONS

A. Provide fabrications of cast solid polymer material composed of acrylic polymer with mineral fillers and pigments where indicated. Material shall not be coated or laminate to substrates. Superficial damage to a depth of 1/64" shall be repairable by sanding or polishing. Products by:

1. Avonite Surfaces.

2. DuPont Corian.

B. Size:

1. Width / Height: Fabricator's standards of size best meeting the project requirements. Backsplash to be 4" in height, unless otherwise indicated.

2. Thickness:

a. Horizontal surfaces - 3/4" minimum.

b. Vertical surfaces - 1/2" minimum; backsplashes - 3/4".

C. Finish: Polished, unless otherwise indicated. Top, backsplash and fascia shall be one-piece. Color, edge detail and pattern shall be as selected from the fabricator's standards.

D. Color / Pattern: The basis of design is products by Avonite or approved comparable color / pattern.

E. Related Materials:

1. Panel Adhesive: Fabricator's standard specifically recommended for the Project application. Adhesives used at installations exposed to water or high humidity conditions to be water-resistant type.

2. Joint Adhesive: Fabricator's standard capable of fusing each joint and creating inconspicuous and non-porous joints.

3. Sealant: Fabricator's recommended mildew resistant, FDA / UL recognized silicone sealant, in colors custom matched to each component where sealant is required.

4. Mounting Hardware: Provide mounting hardware including sink / bowl clips, inserts and fasteners for the attachment of undermount sinks and lavatories.

5. Anchorage Devices: Fabricator's approved clips, inserts, and anchorage devices . Ferrous products to be hot-dipped galvanized. Do not use metal types not specifically approved by the fabricator for their products.

F. Fabrication:

1. Factory fabricate components to the greatest extent possible, to the sizes and shapes indicated, in accordance with the approved Shop Drawings. Where indicated, factory fabricate side and back splashes with 1/2" cove at intersections.

2. Form joints between components using the fabricator's standard acrylic joint adhesive. Joints shall be inconspicuous, non-porous, and reinforced with strips of solid polymer material in accordance with the fabricator's printed instructions.

3. Tolerances:

a. Variation of component size: +/- 1/8".

b. Location of openings: +/- 1/8" from the required location.

4. Provide factory cutouts for plumbing and accessories as indicated. Reinforce heated or cooled cutouts in accordance with the Approved Shop Drawings and the fabricator's printed instructions.

5. Cut an finish components edges with clean returns. Round edges of cutouts to 1/8" radius. Round corners of cutouts with 1/2" minimum radius. Use router to form all cutouts. Provide thick edges where indicated using strips of solid polymer material and fabricator's acrylic joint adhesive. All joints to be inconspicuous and non-porous. All exposed surfaces to have a uniform finish and gloss.

6. Countertop Joint Layout: Provide a monolithic look to the greatest extent possible. Where joints in the work is required due to fabrication limitations or required for proper performance of the product, work with the Owner's representative to establish satisfactory joint locations.

2.3 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide complete cabinet hardware and accessory materials associated with the architectural woodwork, except for units specified as "door hardware" in other Sections of these Specifications.

B. Hardware References: Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware".

C. Cabinet Door Hardware: Provide hinges and pulls of the types indicated, to accommodate each door size and style. Hinges concealed "European" style; Pulls - EPCO DP-418 x 3-1/2" wire pull or as indicated or approved.

1. Each cabinet door up to 36" in height shall have one pair of hinges; up to 48" in height, 1-1/2 pair hinges; over 48" in height, two pair of hinges. Each cabinet shall be equipped with sound dampening cushions to minimize noise.

D. Drawer Hardware: Provide slides and pulls of the types indicated, to accommodate each drawer size and style.

1. Equip each drawer with side-mounted, full-extension, ball-bearing, nylon roller drawer slides with a load capacity of 75 pounds per pair; provide "stay-closed" feature for lift out removal.

E. Locks: Provide standard pin-type or disc-type (five pins or discs) tumbler locks, keyed individually, except as otherwise indicated.

F. Shelf Supports: Where shelving is indicated as "adjustable", provide pin-type or slotted-type standards and brackets of a type required to support shelves with a uniform load of 40 pounds per square foot; recessed for premium construction, surface-mounted for custom and economy construction.

2.5 ACCESSORIES

A. Adhesive: Type recommended by AWI to suit the application.

1. Adhesives shall have a VOC content of 50 g/L or less.

B. Fasteners: Size and type to suit the application.

C. Bolts, Nuts, Washers, Lags, Pins and Screws: Of the size and type to suit the application.

D. Concealed Joint Fasteners: Threaded, hot-dipped galvanized steel.

E. Sealant: Manufacturer's recommended mildew resistant, FDA / UL recognized silicone sealant in colors custom matched to each component where sealant is required.

F. Anchorage Devices: Fabricator's project approved clips, inserts, and anchorage devices. Ferrous products to be hot-dipped galvanized. Do not use metal types not specifically approved by the fabricator for their products.

2.6 FABRICATION

A. Field Measurements:

1. Before proceeding with the fabrication of architectural woodwork products, obtain field measurements and verify dimensions.

B. Wood Products:

1. Fabricate architectural woodwork products to the dimensions, profiles and details indicated, with construction and materials complying with the referenced standards of the specified AWI grades. Where necessary for fitting at the Project Site, provide reasonable allowance for scribing, trimming and fitting. Pre-cut openings, where possible, to receive hardware and mechanical and electrical work.

2. Conceal all anchorage devices, except where decorative fasteners are approved.

C. Fire-Retardant Treatment:

1. Where fire-retardant wood is specified or otherwise indicated, provide materials which comply with AWPA standards for pressure impregnation with fire-retardant chemicals, and which have a flame spread rating of not more than 25 when tested in accordance with UL 723 or ASTM E 84, and show no increase in flame spread and significant progressive combustion upon continuation of the test for an additional twenty (20) minutes.

2. Where treated items are exposed to the exterior or to high humidity or are to have a transparent stain or sealer finish, provide appearance grade materials which show no change in the fire hazard classification when subjected to standard rain test per UL 790 or ASTM B 2898.

3. Use fire-retardant treatment which will not bleed through or adversely affect the type of finish indicated, and which does not require brush treatment of field made end cuts to maintain the fire-hazard classification.

D. Products Scheduled for Transparent Finish:

1. Treatment color shall be compatible with products scheduled for a transparent finish. Provide samples of treatment with finish applied for review.

2. Where a transparent finish is indicated, use the type of treatment and species which permits milling of the lumber after treatment without altering the indicated fire-hazard classification, as determined by fire testing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive the work.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition woodwork to the average prevailing humidity conditions in the installation areas before installing.

B. Install concrete inserts and similar anchoring devices to be built into substrates well in advance of the time the substrates are to be built.

C. Prior to the installation of architectural woodwork, examine shop fabricated units for completion, and complete work as required, including back priming and removal of packing.

3.3 INSTALLATION

A. Set and secure fixtures in place at the locations indicated on the Drawings.

B. Cabinets and countertops shall be installed by factory-trained personnel, or by personnel experienced in installing the type of countertops and splashes required.

C. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims.

D. Scribe and cut work to fit adjoining work; refinish cut surfaces or repair damaged finishes at cuts in strict accordance with the fabricator's instructions.

E. Secure woodwork to anchorage devices or blocking built-in or directly attach to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nail as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersink and fill flush with the woodwork surface. Match the final finish where transparent finish is indicated.

F. Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory

items as indicated. Maintain the indicated veneer sequence matching of casework with transparent finish.

G. Secure fixtures to the floor using appropriate angles and anchorages.

H. Countertops: Anchor securely to base units and other supports as indicated, in strict accordance with the fabricator's instructions.

I. Wood Storage Shelving: Complete the assembly of units and install in the locations indicated, including hardware and accessories, as indicated.

J. Finish: AWI quality standard. Leave woodwork in paint ready condition for final finishing by the painting applicator.

K. Apply sealant at all joints between architectural woodwork and adjacent floor and walls.

3.4 CONSTRUCTION

A. Interface with Other Work:

1. Coordinate the installation sequence of fixtures with the trades providing utilities to the units.

B. Tolerances:

1. Fabrication: Variation of Components Size: + 1/8". Location of Openings: + 1/8" from the required location.

2. Installation: 1/8" in 8'-0" for plumb and level, including countertops, and with 1/64", maximum, offset in flush adjoining surfaces; 1/32" maximum offsets in revealed adjoining surfaces.

C. Finishing:

1. Repair damaged and defective woodwork wherever possible to eliminate defects functionally and visually. Where not possible to repair to the satisfaction of the Owner's representative, replace the woodwork.

2. Touch-up shop applied finishes to restore damaged and soiled areas.

3. Adjust joiner for a uniform appearance.

4. Complete the finishing work specified as work of this Section, to whatever extent not completed in the shop or prior to installation of the woodwork.

3.5 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

B. Lubricate and make final adjustment of moving and operating parts for smooth and correct operation.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect woodwork installations for flush, plumb, level, alignment and secure attachment to substrates.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning and protection of installed work.

B. Clean casework, counters, shelves, hardware, fittings and fixtures.

C. Clean woodwork on exposed and semi-exposed surfaces.

3.8 PROTECTION

A. Installer shall advise the Contractor and paint applicator of the procedures required to protect the woodwork during the remainder of the construction to ensure that the work will be without damage and deterioration at the time of final acceptance.

B. Installer shall return to the Project prior to substantial completion, repair any damage to the work and readjust the hardware.

END OF SECTION

SECTION 08310

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access door and frame units.

2. Wall- and ceiling-mounted locations.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 03300 - Cast-In-Place Concrete: Substrate for anchorage.

2. Section 04230 - Reinforced Unit Masonry: Substrate for anchorage.

3. Section 09110 - Non-Load Bearing Steel Framing: Wall and ceiling framing for attachment of units.

4. Section 09250 - Gypsum Board: Adjacent wall and ceiling finish material.

5. Section 09900 - Painting: Field painting of door and frame units.

1.2 DESCRIPTION OF WORK

A. The extent of access door work is indicated on the Architectural, Mechanical, Plumbing and Electrical Drawings and as specified herein, and includes providing and installing access doors where access to mechanical, plumbing and electrical items is required, whether or not the access doors are shown on the Drawings.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

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

2. ASTM A 568 / A 568M - Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

3. ASTM A 653 / A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

4. ASTM A 1008 / A 1008M - Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

5. ASTM A 1011 / A 1011M - Specification for Steel, Sheet and Strip, Hot-Rolled,
Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

6. ASTM D 2201 - Practice for Preparation of Zinc-Coated and Zinc-Alloy-Coated Steel Panels for Testing Paint and Related Coating Products.

C. National Fire Protection Association (NFPA):

1. Standard No. 80 - Standard for Fire Doors and Other Opening Protectives.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer=s technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.

2. Shop Drawings: Indicate the location, size, type, finish, hardware, and details of adjoining work for all access door units.

3. Schedule: Indicate all doors by type, size, rating and location keyed to the Drawings.

3. Assurance / Control Submittals:

a. Manufacturer's certificate that products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01700 - Contract Closeout: Procedures for closeout submittals.

1. Project Record Documents: Accurately record the location of all access units.

2. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

B. Fire-Resistance Ratings: In all Corridor walls, rated partitions and ceilings, provide access door assemblies with panel door, frame, hinge, and latch from a manufacturer listed in

Underwriter=s Laboratories, Inc; ACClassified Building Materials Index@ for 90 minutes rating.

1. Provide UL label on each fire-rated access door.

C. Size Variation: The selected manufacturer=s standard units may vary in size slightly from the sizes indicated herein. Secure the Owner representative=s approval for sizes that differ from the units specified.

D. Coordination: Furnish inserts and anchoring devices which must be built into other work for the installation of access doors. Coordinate delivery with other trades to avoid delaying the work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.

B. Deliver products to the Project Site in the manufacturer=s original, unopened packaging, dry and undamaged with seals and labels intact.

C. Handle and store to prevent damage to frames, panels and operating mechanisms.

1.7 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout.

B. Special Warranty:

1. Provide a written Warranty, signed by the manufacturer, and the Installer agreeing to repair or replace doors and panels that do not meet the requirements, or that fail in materials or workmanship.

2. Warranty Period: Two (2) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. J. L. Industries, Inc.

2. Karp Associates, Inc.

3. Larsen=s Manufacturing Co.

4. Milcor (Gibraltar Building Products).

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 ACCESS DOORS

A. General: Manufacturer=s standard fully-welded steel construction. Provide units with means for anchoring properly to the adjacent construction.

B. Non-Fire-Rated Units:

1. Doors:

a. Flush Units: 14 gage, minimum.

b. Recessed Units: 18 gage, minimum.

2. Hinges: Stainless steel, piano or pin type, concealed and continuous, 175 degrees opening, constant force closure, spring type.

3. Operation: Flush screw driver slot for quarter turn cam latch with welded steel access sleeves at recessed panel doors.

C. Fire-Rated Units: As required for the fire-rating, but not less than the following:

1. Doors: Steel-faced, insulated core panel, 20 gage minimum.

2. Hinges: Stainless steel, piano or pin type, concealed and continuous, 175 degrees opening, constant force closure with spring or other self-closing mechanism.

3. Operation: Flush screw driver slot for quarter turn cam latch.

D. Unit Construction Types:

1. Non-Fire-Rated:

a. Flush: Flush door with bead to give the unit a frameless appearance.

b. Recessed: Recessed door to allow installation of acoustical tile, gypsum board or similar finish into the recess to provide a concealed appearance. Units for plaster or mortarbed to have integral expanded metal lath.

c. Universal: Flush door with exposed frame, Exposed flange of frame not to exceed 1" in width.

2. Fire-Rated: Flush insulated door with exposed frame. Exposed flange of frame not to exceed 1" in width, unless approved otherwise.

2.3 FABRICATION

A. General: Fabricate each access door assembly as an integral unit, complete, with all necessary parts, and ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction. Fill and grind welds smooth and flush with adjacent surfaces. Fabricate units square. Furnish attachment devices and fasteners of the type required to secure the units to the adjacent substrate. All doors in fire-rated assemblies shall have been tested and have a Class B, 1-1/2 hour fire-rating label attached.

C. Frames and Flanges:

1. Fabricate frames from 16 gage steel, minimum, with exposed flanges approximately 1" in width around the perimeter of the frame for units to be

installed in the following construction types, except as noted:

a. Exposed concrete.

b. Exposed masonry.

c. Gypsum board.

2. For installation in masonry construction, fabricate frames with adjustable metal masonry anchors.

3. For installation in plaster finish, fabricate frames with galvanized expanded metal lath, and exposed casing bead welded to the perimeter of the frame.

D. Access doors and frames for installation in concrete, masonry, plaster and ceramic tile shall be flush, stainless steel; #4 satin finish: Model DSC-214M by Karp Associates or approved equal.

E. Access doors for installation in gypsum board shall be concealed frame, recessed; finish as selected: Model KDW by Karp Associates or approved equal.

F. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets. Install in a hole cut thru the finish material.

G. Finish: Phosphate treated and shop painted with the manufacturer-s standard rust inhibitive primer.

2.4 ACCESSORIES

A. Anchorage Devices:

1. Devices of the type required to secure units to the abutting structure.

2.5 SCHEDULE

A. General: Where not otherwise indicated, provide access doors in accordance with the following:

1. Size: As required to comfortably achieve the purpose for which access is required.

2. Types:

a. Flush: In non-public areas that are not restrooms, conference rooms or offices.

b. Recessed: In all public areas, restrooms, conference rooms and offices.

c. Universal: In exposed concrete and masonry surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that rough openings for the units are correctly located and properly sized.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install units in accordance with the manufacturer's published instructions, where indicated on Drawings, and where required for access.

B. Coordinate with mechanical, plumbing and electrical trades and other work requiring access.

C. Position units to provide convenient access to concealed work requiring access.

D. Set frames in position accurately and securely attached to supports with face panels plumb and level in relation to the adjacent finish surfaces.

E. Field paint surfaces exposed to view. See Section 09900 - Painting.

F. Built-in anchors and grouting of frames in concrete and masonry is included in Sections of Divisions 3 and 4.

3.3 PROTECTION

A. Institute and maintain protective measures and take other precautions necessary to ensure that all assemblies will be without damage and deterioration at the time of final acceptance.

3.4 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

B. Adjust hardware and panels after installation for proper operation.

C. Remove and replace panels and frames that are warped, bowed, twisted or otherwise damaged.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control: Field inspection.

B. Inspect installed units for location, alignment, plumb, level, attachment to framing, and operation.

3.6 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Clean the units before final acceptance inspection.

END OF SECTION

SECTION 09110

NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior non-load-bearing steel partition framing.

3. Interior suspended steel ceiling framing.

4. Blocking and backing plates.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 05500 - Metal Fabrications: Backing plates.

2. Section 06100 - Rough Carpentry: Wood blocking.

3. Section 07900 - Joint Sealers: Sealants.

4. Section 09250 - Gypsum Board: Wall finish.

1.2 DESCRIPTION OF WORK

A. The extent of non-load-bearing steel framing work is indicated on the Drawings and as specified herein, and includes providing and installing interior partition framing, suspended ceiling framing, furring and metal blocking and backing plates in walls and ceilings.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

2. ASTM C 645 - Specification for Non-Structural Steel Framing Members.

3. ASTM C 754 - Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

4. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.

5. ASTM C 954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-inch (0.84 mm) to 0.112- inch (2.84 mm) in Thickness.

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

7. ASTM D 2201 - Standard Practice for Preparation of Zinc-Coated and Zinc-Alloy-Coated Steel Panels for Testing Paint and Related Coating Products.

8. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

9. ASTM E 90 - Standard Test Method for Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.

10. ASTM E 413 - Classification for Rating Sound Insulation.

11. ASTM E 119 - Standard Test Method for Fire Tests of Building Construction and Materials.

C. Gypsum Association

1. GA-600 - Fire Resistance Design Manual.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data:

a. Framing Members: Standard materials and finish, product criteria, sizes and lengths, load charts and limitations.

b. Fasteners and Anchorage Devices: Standard materials and finish, sizes and load charts.

2. Shop Drawings:

a. Indicate prefabricated work, component details, framing layout, framed openings, anchorage to the structure, type and location of fasteners and accessories or items required of other related work.

b. Indicate the method of securing studs and framing to tracks, splicing, suspension, blocking / backing plates for support of items specified in other Sections and reinforcement of framing connections.

c. Indicate details associated with fireproofing and acoustical seals.

d. Indicate location of blocking and backing plates required for installation of other work.

3. Samples:

a. If requested, two (2) 6" long sections of each shape required.

4. Assurance / Control Submittals:

a. Documentation of experience indicating compliance with the specified qualifications requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Protect metal framing materials from corrosion, deformation and other damage during delivery, storage and handling.

C. Deliver products to the Project Site in the manufacturer=s original, unopened packages, containers or bundles bearing the brand name and identification of the manufacturer.

D. Store and protect the metal framing with a weatherproof covering; ventilate to avoid condensation.

E. Store, handle and install to prevent bending.

1.7 JOB CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Unimast Incorporated.

2. Dale Industries.

3. National Gypsum Company (Gold Bond Building Products).

4. Clark Steel Framing Systems.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

A. Unimast Incorporated framing component designations are used within this Section to establish quality and to identify the framing types.

B. Interior Non-Load-Bearing Partition Framing: ASTM C 645 and D 2201; galvanized sheet steel, channel shaped, punched for utility access, depth as indicated on the Drawings, gages as indicated below, unless indicated otherwise on the Drawings.

1. 212ST20 - 2-1/2" Studs - Unbraced Length 13 Feet or Less: Minimum 20 gage; Minimum 18 gage where greater than 13 feet.

2. 358ST22 - 3-5/8" Studs - Unbraced Length 18 Feet or Less: Minimum 22 gage; Minimum 20 gage where greater than 18 feet.

3. 600ST22 - 6" Studs - Unbraced Length 25 Feet or Less: Minimum 22 gage: Minimum 20 gage where greater than 25 feet.

4. Bridging - Same depth and gage as the studs.

C. Partition Floor Tracks and Runners: ASTM C 645 and D 2201; galvanized sheet steel, channel shaped, solid web, same depth and gage as the studs.

1. 22 Gage Studs: CR22 x stud size.

2. 20 Gage Studs: CR20 x stud size.

D. Slip-Type Top Tracks: Provide one of the following:

1. Deflection Track: Steel sheet top runner, manufactured to prevent the cracking of finishes applied to interior partition framing resulting from deflection of the structure above; in thickness not less than the studs and in a width to accommodate the depth of the studs.

2. Double Runner System: ASTM C 645 runner; inside runner with 2" deep flanges, in thickness not less than that indicated for the studs and fastened to the studs; outer runner sized to friction fit inside the inside runner.

3. Single Long-Leg Runner System: ASTM C 645 runner with 2" deep flanges, in thickness not less than that indicated for the studs, installed with studs friction fit into the runner and with bridging located within 12" of the top of the studs.

E. Partition Framing Fasteners: Corrosion-resistant, self-drilling, self-tapping steel screws.

1. 22 Gage Framing: ASTM C 1002; 3/8", Type S, pan head.

2. 20 Gage and Heavier Framing: ASTM C 954; 5/8", Types S-12, low-profile head.

F. Partition Floor Track Anchorage Device: Low velocity, powder-actuated drive pins; minimum 0.140" shank diameter x 1-1/2" shank length with 7/8" diameter washer.

1. DX 451 System using X-DNI Pins with R23 washers by Hilti.

2. Ramset / Red Head System using 4700SD Pins by ITW Ramset / Redhead.

G. Suspended Interior Ceiling and Soffit Framing:

1. Wire Hangers: ASTM A 641 / A 641M, Class 1 zinc coating, soft temper, 0.162" diameter.

2. Flat Hangers: Galvanized steel sheet, 1" x 3/16" x length required.

3. Stud Hangers: ASTM C 645; cold rolled, galvanized sheet steel, channel shaped, cross braced, minimum 20 gage.

4. Carrying Channels: ASTM C 645; cold rolled, galvanized sheet steel, channel shaped, minimum 20 gage.

5. Furring Channels: ASTM C 645; galvanized, hat-shaped, 7/8" deep x 1-1/2" wide, 25 gage.

6. Tie Wire: ASTM A 641 / A 641M, Class 1 zinc coating, soft temper, 0.0625" diameter.

H. Flat Straps and Backing Plates: ASTM D 2201; galvanized sheet steel, 22 gage, minimum.

I. Isolation Strips at Exterior Walls and Suspended Concrete Floors: ASTM D 226; asphalt-saturated organic felt, Type I (No. 15 asphalt felt), non-perforated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that building framing components are ready to receive the work.

2. Verify that rough-in utilities are in-place and properly located where required.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 INSTALLATION - PARTITION FRAMING

A. Install framing and fasteners in accordance with the manufacturer's published instructions and ASTM C 754.

B. Install tracks / runners at floors, ceilings, and structural walls and columns where steel framing abuts.

1. Install asphalt felt between tracks / runners and wall / floor where framing is installed directly against exterior walls and floor slabs.

C. Metal Stud Spacing: 16" on center, maximum.

D. Align stud web openings horizontally; install horizontal bridging at 5' o.c., maximum.

E. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate below suspended ceilings.

F. Install studs so flanges point in the same direction.

G. Splice studs with an 8" nested lap, minimum; fasten each stud flange with a minimum of two (2) screws.

H. Construct corners using a minimum of three (3) studs.

I. Install double studs at wall openings and door jambs, maximum 2" from each side and at the top of openings.

J. Extend vertical jamb studs through suspended ceilings and attach to the underside of the structure above.

K. Frame other openings, in the same manner as for doors.

L. Place studs 2", minimum, from abutting walls.

M. Install intermediate studs above and below openings to match the wall stud spacing.

N. Fasten studs adjacent to door frames, partition intersections and corners to the top and bottom runner flanges in double-stud fashion.

1. Securely fasten studs to jamb and head anchor clips of doors and borrowed light frames.

2. Place a cut-to-length section of runner horizontally with the web-flange bent at each end; fasten with a minimum of two (2) fasteners per flange.

3. Position a cut-to-length stud (extending to the top runner) at vertical panel joints over door and window headers.

O. Allow for deflection of roof or floor slabs.

1. Leave 1/2" gap between the top end of studs and the top track.

P. Framing Fastening: Fasten framing in accordance with the manufacturer's published instructions and the schedule below, unless indicated otherwise on the Drawings.

Connection	Fasteners
Floor and Top Track to Concrete	1 pin at 32" on center
Partition Stud to Floor Track	1 screw each side, each flange
Partition Stud to Top Track	1 screw each side, each flange in slotted hole to allow slab deflection
Plates and Straps to Studs	2 screws
Stud Web to Stud Web	2 screws
Runner to Header	1 screw at 16" on center, maximum 6" from each end

Q. Install framing, blocking and backing plates between studs for the attachment of work by other trades.

R. Install batt insulation in walls and ceilings, where indicated on the Drawings and as specified in Section 07210 - Building Insulation.

3.3 INSTALLATION – CEILING FRAMING

A. Suspend ceiling hangers directly from the building structure.

1. Install hangers plumb and free from contact with other objects within the ceiling plenum.

2. Where other construction within the ceiling plenum interferes with the typical hanger spacing, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support the imposed ceiling loads.

3. Secure wire hangers by looping and wire-tying, either directly to the structure or to inserts.

4. Do not suspend framing from ducts, pipes or conduits.

5. Keep hangers and braces 2" clear of ducts, pipes and conduits.

B. Install framing per ASTM C 754.

1. Install framing components in the sizes and spacing indicated on the Drawings, but not less than that required by the referenced standards.

C. Wire-tie furring channels to support the framing.

D. Attach perimeter wall track or angle where the suspension system meets vertical surfaces. Mechanically join the main beam and cross-furring members to each other and fit furring into the wall track.

E. Install compression struts and sway bracing system with tie wires as indicated on the Drawings, and as required by the Building Code.

1. Provide hanger wires splayed 45 degrees within 3" of the intersection between main runners and cross runners, and at each light fixture.

2. Provide compression struts and splayed hanger wire sway bracing as follows:

a. Within 6 feet of walls.

b. At 12 feet on centers, maximum.

F. Install steel framing components for suspended ceilings so members for attachment of finish panels are level to within 1/8" in 12 feet measured lengthwise and transversely.

G. When the ceiling system provides lateral support for permanent or relocatable partitions, the connection, ceiling system and lateral force bracing shall be sized and installed to support the reaction force of the partitions.

3.5 INSTALLATION - BLOCKING AND BRIDGING

A. Screw attach wood blocking / metal backing plates between studs for the support of surface-mounted items for:

1. Wall cabinets.

2. Hardware.

3. Architectural woodwork.

4. Other items requiring backing for attachment.

B. Provide bridging between opposite sides of plumbing cavity walls at a maximum of 36" o.c., vertically.

3.6 CONSTRUCTION

A. Interface with Other Work:

1. Coordinate the erection of studs at openings and with door and window frames.

2. Coordinate the installation of anchors, supports and blocking for mechanical, electrical and building accessory items installed within the framing.

B. Site Tolerances:

1. Maximum Variation From True Position: 1/8" in 10 ft.

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2. Maximum Variation From Plumb: 1/8" in 10 ft.

3.7 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control: Field inspection.

B. Inspect metal framing erection, placement, spacing, seismic joints, expansion joints, fasteners and connections.

END OF SECTION

SECTION 09250

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board.

2. Cement board.

3. Accessories.

4. Joint treatment.

5. Finishing.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 06100 - Rough Carpentry: Wood framing and blocking for attachment of gypsum board.

2. Section 09110 - Non-Load Bearing Steel Framing: Metal framing for attachment of gypsum board.

3. Section 09900 - Painting: Field paint finish on gypsum board.

1.2 DESCRIPTION OF WORK

A. The extent of gypsum board work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing gypsum board for all applications, cement fiber board, galvanized and PVC trim, accessories and the finishing of installations exposed to view.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM C 475 - Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

2. ASTM C 630 - Specification for Water-Resistant Gypsum Backing Board.

3. ASTM C 840 - Specification for the Application and Finishing of Gypsum Board.

4. ASTM C 954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inches (0.84 mm) to 0.112 inches (2.84 mm) in Thickness.

5. ASTM C 919 - Practice for Use of Sealants in Acoustical Applications.

6. ASTM C 1002 - Specification for Steel Self-Piercing Topping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

7. ASTM C 1280 - Specification for Application of Gypsum Sheathing.

8. ASTM C 1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.

9. ASTM C 1396 - Specification for Gypsum Board.

10. ATM D 3678 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions.

11. ASTM E 119 - Test Methods for Fire Tests of Building Construction and Materials.

C. Gypsum Association (GA):

1. GA-201 - Gypsum Board for Walls and Ceilings.

2. GA-214 - Recommended Specification for Levels of Gypsum Board Finish.

3. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

4. GA-600 - Fire Resistance Design Manual.

D. International Code Council:

1. International Building Code (IBC), 2009.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data required to show compliance with these specifications.

2. Assurance / Control Submittals:

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

c. Test Reports from recognized testing laboratories, upon request.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Fire-Resistance Ratings: Where gypsum drywall systems with fire-resistance ratings are indicated, provide materials and installations which are identical to those of applicable assemblies tested per ASTM E 119 by a fire testing laboratory acceptable to the authorities having jurisdiction.

1. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File No. S in GA "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to the authorities having jurisdiction.

C. Single-Source Responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturer's recommended by the prime manufacturer of the gypsum board.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Deliver products to the Project Site in the manufacturer's original, unopened, undamaged packages, containers, or bundles bearing the brand name with identification labels intact.

C. Store materials inside and under cover; keep dry; protect from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

D. Neatly stack gypsum boards flat to prevent sagging.

E. Handle to prevent damage to edges, ends and surfaces.

F. Protect corner beads and trim from being bent and damaged.

1.7 JOB CONDITIONS

A. Environmental Requirements, General: Comply with requirements of the referenced gypsum board application standards and recommendations of the gypsum board manufacturer for environmental conditions before, during and after installation.

B. Ventilation: Ventilate building spaces as required to remove water in excess of that required for the drying of joint treatment materials immediately after application. Prevent drafts during hot, dry weather to avoid excessively rapid drying.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. United States Gypsum Co.

2. National Gypsum Company (Gold Bond Building Products).

3. Georgia-Pacific.

4. Domtar Gypsum.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 GYPSUM BOARD MATERIALS

A. General:

1. Provide boards where called for on the Drawings in lengths to minimize the number of end-to-end butt joints.

2. United States Gypsum (Sheetrock) designations are used in this Section to identify gypsum board and accessory types, unless otherwise noted.

B. Standard Gypsum Board: ASTM C 1396; natural finish, paper faces, 1/2" at ceilings and over wall furring, 5/8" thick at walls unless noted otherwise, 48" width, maximum practical length to meet conditions; ends square cut, tapered edges.

1. Provide where gypsum board is called for unless otherwise indicated.

C. Fire-Resistant Gypsum Wallboard: Type X, ASTM C 1396; paper faces, 1/2" at ceiling, or 5/8" thick at walls, 48" width, maximum practical length to meet conditions; ends square cut, edges tapered; providing at least 1-hour fire-retardant rating when tested in accordance with ASTM E 119.

1. Provide where a fire-resistance rating is required.

D. Water-Resistant Gypsum Backing Board: ASTM C 630; 1/2" at ceiling and over wall furring, and 5/8" thick at walls, 48" width, maximum practical length to meet conditions; ends square cut; edges tapered; ends and edges straight and solid. Board consisting of a non-combustible water-resistant gypsum core, surfaced on face and back with green treated water-repellent paper bonded to the core. Suitable for receiving paint or wallpaper and in compliance with IBC.

1. Provide at ceilings and walls in showers, toilets and other wet areas not scheduled for tile finish.

E. Cement Board: High density, glass fiber reinforced, 1/2" thick x 26" or 48" width; Durock Cement Board as manufactured by United States Gypsum or approved equal.

1. Provide at shower and toilet room walls scheduled to receive ceramic tile finish, and at ceilings and walls exposed to the weather.

2.3 FASTENERS

A. Metal Framing: ASTM C 1002, Type S, Phillips-head recess, bugle head, corrosion-resistant, self-drilling, self-tapping, fine thread steel screws.

1. One Layer 1/2" board: 1" long.

2. One Layer 5/8" board: 1-1/8" long.

2.4 TRIM ACCESSORIES

A. General: Install vinyl plastic accessories at exterior work and work in high humidity and non-air-conditioned spaces. Use galvanized accessories at interior air conditioned, normally humidity areas.

B. Plastic Accessories: High-Impact PVC plastic; ASTM D 3678, including corner beads, stop beads, casing beads, trim beads, baseboard and ceiling beads; as manufactured by Plastic Components, Inc. or approved equal.

C. Galvanized Accessories:

1. Edge Trim: Galvanized steel casing.

a. "L" shape for tight abutment at edges; Sheetrock Brand, No. 200-B.

b. "J" shape at other locations; Sheetrock Brand, No. 200-A.

2. Corner Beads: Galvanized steel corner beads, Sheetrock Brand, Dur-A-Bead Metal Corner Bead.

3. Control Joint: Roll-formed zinc; Sheetrock Brand, Zinc Control Joint.

D. Pre-finished Corners: Pre-finished inside corner reinforcement as manufactured by ULTRAFLEX or approved equal.

2.5 JOINT TREATMENT MATERIALS

A. General: Type recommended by the gypsum board manufacturer for the application, except as otherwise indicated; ASTM C 475.

B. Reinforcing Tape: Cross-fibered paper with high tensile strength, roughened surface, accurate center crease; Sheetrock Brand, Heavy Drywall Joint Tape.

C. Joint Compound:

1. Single Grade: Multi-purpose grade for the entire application.

2. Two Grades:

a. Interior and Exterior Work: Use chemically-setting, powder compound type for bedding and filling; Sheetrock Brand, Durabond Joint Compound or Easy Sand Lightweight Setting Type Joint Compound.

b. Topping: Use ready-mixed, lightweight, vinyl formulation or vinyl powder; Sheetrock Brand, Lite Taping Joint Compound.

D. Water-Resistant Joint Compound: Special water-resistant type for treatment of joints, fastener heads and cut edges of water-resistant backing boards.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials of the type and grade recommended by the gypsum board manufacturer.

B. Adhesives: Commercial adhesives; ASTM C 557.

1. Laminating: Special adhesive or joint compound specifically recommended by the gypsum board manufacturer for laminating gypsum boards.

2. Water-Resistant: Type I, organic adhesive for ceramic tile; ANSI A136.1.

C. Blocking and backing Plates: Provided by the trade responsible for Section 09110; located by the appropriate trade or as indicated below.

1. Casework and Other Trades: 14 gage galvanized steel, minimum; 3" wide x length required.

2. Plumbing: Size as required for the relevant wall-hung fixture.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates, blocking and backing plates and conditions are as required, and ready to receive the work.

C. Report, in writing, prevailing conditions that will adversely affect the satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PRE-INSTALLATION MEETING

A. Prior to commencing work, meet on-site with the Owner's representative and all concerned trades to review the work required by this Section.

3.3 GENERAL REQUIREMENTS

A. Install in accordance with reference standards, manufacturer's instructions, product technical bulletins, product catalog and product carton instructions and as required to comply with seismic requirements.

B. Install supplementary framing, blocking and bracing at terminations in gypsum board assemblies to support fixtures, equipment, heavy trim, grab bars, toilet accessories, cabinetry, furnishings and similar construction.

C. Install metal framing and gypsum board to enclose all pipes, ducts, conduit, etc. which would otherwise be exposed in finished areas, regardless of whether or not furring is shown or indicated on the Drawings.

D. Enclosures to receive recessed light fixtures in fire-rated ceilings shall conform to U.L. requirements for materials and assemblies. Provide U.L. Design No. P251 enclosures over all types of recessed lights.

E. Defects which appear in the work due to faulty workmanship and / or materials, shall be repaired and refinished with materials and in a manner to meet the requirements of this Section.

3.4 GYPSUM BOARD INSTALLATION REQUIREMENTS

A. Application and Finishing Standards: Install in accordance with manufacturer's published instructions, GA-201, GA-216 and ASTM C 840.

B. Locate exposed end-to-end butt joints as far as possible from the center of walls and ceilings, and stagger not less than 1'-0" in alternate courses.

C. Install ceiling boards in the direction and in a manner that will minimize the number of end-to-end butt joints and avoid end joints in the central area of each ceilings. Stagger end joints at least 1'-0".

D. Install wall / partition boards vertically to avoid end-to-end butt joints to the extent possible. Use boards of maximum practical lengths; where applicable stagger end joints. Cut and saw all openings; do not core and punch. Apply edge bead to all exposed edges and outside corners.

E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force boards into place.

F. Locate either edge or end joins over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so both tapered edge joints abut, tapered edges against tapered edges and mill-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends.

G. Stagger vertical joint over different studs on opposite sides of partitions.

H. Attach gypsum boards to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Isolate perimeter of non-load bearing gypsum board partitions at structural abutments. Provide 1/4" to 1/2" space and trim edges with "J" type, semifinished, edge trim. Seal joints with acoustical sealant.

J. Form control joints and expansion joints with space between edges of boards prepared to receive trim accessories.

K. Space fasteners in boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

3.5 GYPSUM BOARD INSTALLATION METHODS

A. Single Layer Applications:

1. Install single layer gypsum board in the most economical direction, with edges and ends attached to firm bearing surfaces; panel ends aligning and parallel with framing members.

2. Apply gypsum board on walls and partitions vertically unless indicated otherwise, and provide sheet lengths that will minimize the number of end-to-end butt joints.

3. Apply gypsum board on furring with no end joints. Locate edge joints over furring members.

4. Apply gypsum board on ceilings prior to application on walls and partitions, to the greatest extent possible.

5. Treat cut edges, holes, fastener heads and joints, including those at angle intersections in water-resistant gypsum board, cement board and gypsum sheathing at exterior ceilings and soffits with the specified joint compound. Treat prior to installation.

6. Do not align panel joints with edges of openings.

B. Single Layer Fastening Methods: Secure boards to supports as follows:

1. Install fasteners from the center of the panel field toward the ends and edges. Install fasteners 3/8" from ends and edges of panels, and as follows:

a. Ceiling: 12" on center, perimeter and field.

b. Walls: 12" o.c. in the field of walls and 8" o.c. at vertical joints.

C. Shower Room Ceilings: Install paperless gypsum board in accordance with the manufacturer's instructions. Reinforce all joints with glass mesh tape and coat the entire surface with a recommended compound to provide a smooth, even finish over the entire surface.

3.6 GYPSUM BOARD TRIM INSTALLATION

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as used to fasten the gypsum boards to supports. Otherwise, fasten flanges by nailing or stapling in accordance with the manufacturer's instructions and recommendations.

B. Install plastic corner beads at external corners. Use the longest practical lengths. Place edge trim where panels abut dissimilar materials.

C. Install plastic edge trim wherever the edge of gypsum board would otherwise be exposed or semi-exposed. Provide the type with face flanges to receive joint compound except

where semi-finishing type is indicated. Install "L" trim where work is tightly abutted to other work and install special kerf-type where other work is kerfed to receive the long leg of "L" trim. Install "J" trim where the edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install semi-finishing trim where indicated, and where exterior gypsum board edges are not covered by applied moldings or indicated to receive trim with face flanges covered with joint compound.

E. Install plastic edge trim or pre-finished internal corners where indicated on wall panels at junctures with ceilings.

F. Install control joints where indicated.

3.7 JOINT TREATMENT

A. Reinforce interior and exterior corners at ceiling and wall surfaces.

B. Apply 2" wide coated glass fiber tape at cement backer board corner joints.

C. Install control joints the full height of partitions consistent with the lines of building spaces, with 1/4" gap between panels. Apply sealant at the back of the joint and a control joint accessory at the face.

D. Apply 3" wide initial coating of joint compound, press tape firmly into the compound; wipe off excess compound. Apply a second coat of joint compound with tools of sufficient width to extend beyond the joint center approximately 4". Draw the joint compound down to a smooth even plane.

E. Sand after the second and third applications of joint compound. Do not raise the nap of the paper when sanding.

F. Feather coats onto adjoining surfaces with a maximum camber of 1/32" in 12".

G. After drying or setting, sand or sponge joints, edges, and corners, eliminating high spots and excessive compound to produce a smooth finish surface.

H. Prepare surfaces to receive subsequent finishes to a height of 6" above the finished ceiling.

3.8 GYPSUM BOARD FINISHING

A. General:

1. Refer to Sections on painting, coatings and interior design documents for decorative finishes to be applied to gypsum board work. Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare the work for decoration.

2. Prefill open joints and rounded or beveled edges, if any; use the type of compound recommended by the manufacturer.

3. Apply joint tape at joints between gypsum boards except where a trim accessory is indicated. Apply joint compound in three (3) coats (not including prefill of openings in the base); sand between the last two coats and after the last coat.

B. Skim Coat: Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, apply a thin skim coat of joint compound over the entire gypsum board surface, after the three-coat joint and fastener treatment has been completed and is dry.

3.9 GYPSUM BOARD FINISH LEVELS

A. Apply finish in accordance with the manufacturer's published instructions and GA-214 Finish Levels.

1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surfaces shall be free of excess joint compound. Tool marks and ridges are acceptable.

a. Application: In plenum areas above ceilings, in attics, in mechanical rooms, in areas where the assembly is generally concealed and in other areas not normally exposed to view. Accessories not required unless shown or required by the rating. Where a fire-resistance rating is required for the gypsum board assembly, the details of construction shall be in accordance with reports of the fire tests of assemblies that have met the fire-rating requirement.

2. Level 2: Embed tape and apply a separate first coat of joint compound to the tape, fasteners and trim flanges.

a. Application: Where panels are the substrate for tile.

3. Level 3: Embed tape and apply separate first and fill coats of joint compound to the tape, fasteners and trim flanges.

a. Application: At surfaces scheduled to receive medium- or heavy-textured finishes or heavy wall coverings before painting.

4. Level 4: Embed tape and apply separate first, fill and finish coats of joint compound to the tape, fasteners and trim flanges.

a. Application: At panel surfaces in mechanical and electrical spaces not exposed to public view.

5. Level 5: Embed tape in joint compound at all joints and interior angles and apply three (3) separate coats of joint compound over all joints, angles, fastener heads and accessories. A thin skim coat of joint compound or a material manufactured especially for this purpose shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with a primer / sealer prior to the application of finish paint. Refer to Specification Section 09900 - Painting.

a. Application: For use where gloss, semi-gloss, enamel and non-textured flat paints are specified, or where severe lighting conditions occur. Generally in all public areas exposed to view, except where noted

otherwise, to provide a uniform surface and minimize the possibility of joints telegraphing and fasteners showing.

3.11 CONSTRUCTION

A. Interface with Other Work:

1. Coordinate the installation of firestopping materials specified in Section 07840 at penetrations through fire-resistive rated gypsum board walls, partitions and ceilings.

2. Coordinate the installation of joint sealers specified in Section 07900 at penetrations of non-fire-restive rated walls, partitions and ceilings.

3.12 PROTECTION

A. Protect other work and finishes from damage by the gypsum board work.

B. Provide protection and maintain conditions which will ensure that the gypsum board work will be without damage and deterioration at the time of Substantial Completion.

3.13 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect the installed work for alignment, attachment to the structure, backing plates and openings for installations by other trades.

3.14 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Clean and remove all debris from the Project Site.

C. Leave the entire Project clean.

END OF SECTION

SECTION 09300

TILE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor tile and base tile.

2. Mortar and grout.

3. Sealer.

4. Metal edge strips.

5. Waterproofing membrane.

6. Tile feature strips and patterns set in paving.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 09250 - Gypsum Board: Substrate for application.

4. Section 07900 - Joint Sealers: Sealant at tile penetrations and dissimilar materials.

1.2 DESCRIPTION OF WORK

A. The extent of the tile work is indicated on the Drawings and Schedules and as specified herein, and includes providing and installing floor and units made from clay and other ceramic materials, waterproofing membrane under tile, metal edge strips, mortar and grout, sealing of expansion and other joints, and feature strips, patterns and accent tiles.

B. Definition: The term "tile" includes ceramic surfacing units and trim made from clay or other ceramic materials.

C. Joint sealants are specified in Section 07900 - Joint Sealers.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American National Standards Institute (ANSI):

1. ANSI A108.4 - Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive.

2. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.

3. ANSI A108.10 - Installation of Grout in Tilework.

4. ANSI A118.1 - Specifications for Dry-Set Portland Cement Mortar.

5. ANSI A118.4 - Specifications for Latex-Portland Cement Mortar.

6. ANSI A118.6 - Specifications for Standard Cement Grouts for Tile Installation.

7. ANSI A136.1 - Organic Adhesives for Latex Portland Cement Mortar.

8. ANSI A137.1 - Specification for Ceramic Tile.

C. American Society for Testing and Materials (ASTM):

1. ASTM C 373 - Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.

2. ASTM C 482 - Test Method for Bond Strength of Ceramic Tile to Portland Cement Plaster.

3. ASTM C 485 - Test Method for Measuring Warpage of Ceramic Tile.

4. ASTM C 499 - Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile.

5. ASTM C 501 - Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.

6. ASTM C 502 - Test Method for Wedging of Flat, Rectangular Ceramic Wall and Floor Tile.

7. ASTM C 648 - Test Method for Breaking Strength of Ceramic Tile.

8. ASTM C 650 - Test Method for Resistance of Ceramic Tile to Chemical Substances.

9. ASTM C 1028 - Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.

D. Americans with Disabilities Act Accessibility Guidelines (ADAAG):

1. Accessibility Guidelines for Buildings and Facilities.

E. Tile Council of America, Inc. (TCA):

1. Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Manufacturer's technical information and installation instructions for the materials required.

2. Shop Drawings: Layout drawings and details for proper installation of the work.

3. Samples:

a. Initial Selection:

1) Manufacturer's color charts of actual tiles or sections of tile showing the full range of colors, textures and patterns available for each type of tile indicated.

2) Grout and accessories requiring color selection.

b. Final Selection:

1) Full size samples of each type of tile and each color and texture selected.

2) Full size samples of each type of trim, accessory, and for each color.

3) Metal edge strip, 6" long.

4. Mock up:

a. Waterproof membrane.

b. 30 SF of tile for pattern and joint width conformation.

c. Expansion and control joints and metal edge strip installations.

5. Assurance / Control Submittals:

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Extra Products: Provide extra products as specified herein below.

1.5 COORDINATION

A. Pre-Installation Meeting: Convene a Pre-Installation Meeting at the Project Site prior to beginning the work of this Section.

1. Require attendance of the Contractor, Owner's representative, Architect, and all impacted trades.

2. Review coordination and environmental controls required for proper installation and ambient conditions in the areas to receive tile work.

3. Review preparation and installation procedures, and the coordination and scheduling required with the related work.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Provide materials from a single source for each type and color of tile, grout, setting material and accessory.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.

B. Deliver tile and setting material to the Project Site in the manufacturer's original, unopened cartons, bearing the name of the manufacturer, the certification mark of the Tile Council of America, and ready for use.

C. Store materials under cover in a manner to prevent damage and contamination.

D. Prevent damage and contamination of materials by water, foreign matter and other causes.

1.8 JOB CONDITIONS

A. Environmental Requirements:

1. Maintain adequate lighting for the installation of tile work. Lighting level shall be equal to permanent lighting level designed for areas receiving the tile work.

2. Maintain sufficient ventilation in areas where the work of this Section is being performed to allow the ceramic tile to properly set.

3. Maintain environmental conditions and protect the work during and after installation to comply with the referenced standards and the manufacturer's printed recommendations.

1.9 MAINTENANCE

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Extra Products: Upon completion of the installation, deliver to the Owner's representative, replacement materials from the same production run as the installed materials; 2% of the total amount of each size, style and color.

PART 2 PRODUCTS

2.1 GENERAL

A. ANSI Standard For Ceramic Tile: Comply with ANSI A137.1 for the types and grades of tile indicated.

B. ANSI Standard For Tile Installation Materials: Comply with the ANSI Standard referenced with the installation products and materials indicated.

C. Colors, Texture and Patterns: For tile and other products requiring the selection of colors, surface textures and other appearance characteristics, provide products to match the characteristics indicated or, if not otherwise indicated, as selected from the manufacturer's standards.

D. Mounting:

1. Where factory-mounted tile is required, provide back or edge mounted tile assemblies as standard with the manufacturer, unless another mounting method is indicated.

2. Where tile is indicted for installation in pools, fountains or at exterior or in wet areas, do not use back or edge mounted tile assemblies unless the tile manufacturer specifies that such type of mounting is suitable for that kind of use and has been successfully used on other projects.

E. Trim Units: Provide tile trim units to match the characteristics of the adjoining flat tile and to comply with the following requirements:

1. Size: As indicted, coordinate with the sizes and coursing of the adjoining flat tiles, where applicable.

2. Shapes: As follows, selected from the manufacturer's standard shapes:

a. Base for Portland Cement Mortar Installations: Coved.

b. Base for Thinset Mortar Installations: Coved.

c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.

d. External Corners for Thinset Installations: Surface bullnose.

e. Internal Corners: Internal cove with cap angle designed to member with the stretcher shapes.

f. Stair tread with nosing.

F. Coefficient of Friction (COF): ADAAG recommends a 0.6 or higher coefficient or higher in dry conditions to meet ADAAG requirements. Typically the COF is indicated in a wet and a dry number under those conditions for the average of the test results. In a situation where there is a potential for water, the tile should meet the COF of 0.6 or higher under wet conditions. ADAAG recommendation for COF on a ramped surface is 0.8. Static coefficient of friction tests are performed according to ASTM C 1028.

2.2 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturer's offering products which may be incorporated into the work include the following:

1. Tile:

a. Dal-Tile Corp.

b. American Olean.

c. Crossville Inc.

2. Mortar and Grout:

a. Hydroment by Bostik.

b. LATICRETE.

c. MAPEI, Corp.

3. Latex-Portland Cement Mortar and Grout:

a. ProSpec (formerly Bonsal).

b. Hydroment by Bostik.

c. LATICRETE.

d. Summitville Tiles, Inc.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.3 TILE, GENERAL

A. Tile: ANSI A137.1.

1. Stain Resistance, CTI Stain Test: Unstainable.

2. Surface Water Absorption, ASTM C 373: 0.5% Max.

3. Abrasive Wear, ASTM C 501: 100.

4. Breaking Strength, ASTM C 648: 250 lbs.

5. Bond Strength, ASTM C 482: 50 psi.

6. Facial Dimension (range), ASTM C 499: 1.5% Max.

7. Range of Thickness, ASTM C 499: 0.04" Max.

8. Warpage (Diagonal), ASTM C 485: ✂0.75% Max.

9. Wedging, ASTM C 502: 1% Max.

10. Chemical Resistance, ASTM C 650: Unaffected.

11. Coefficient of Friction, ASTM C 1028:

a. Dry > 0.7.

b. Wet > 0.6.

12. Scratch Hardness, Moh's Scale: $\geq$ 8.

2.4 CERAMIC TILE

A. Dal-Tile, 12" x 12", ceramic skid-resistant floor tile.

B. Color as selected. Accent tile shall be a contrasting color to the field tile color.

2.5 WATERPROOF MEMBRANE

A. Liquid Applied Membrane: Thin, load-bearing, flexible waterproofing system, self-curing liquid rubber polymer, cold-applied with integral reinforcing fabric to form a seamless membrane.

B. LATICRETE #9235 Waterproofing Membrane by LATICRETE or approved equal.

2.6 MISCELLANEOUS MATERIALS

A. Metal Edge Strip: Brass or stainless steel, as selected; 1/8" wide at the top edge with integral provision for anchorage to mortar bed or substrate, unless otherwise indicated. Style to be as indicated, or appropriate to the use; as manufactured by Schluter Systems, or approved equal. Style to be as appropriate for the use intended

B. Wall Access Panel: Schluter-REMA by Schluter Systems or approved equal.

C. Adhesives: Water-resistant organic; ANSI A136.1.

D. Water: Clean and potable.

E. Reinforcing Mesh: 2" x 2", 16 gauge, galvanized, welded wire.

F. Tile / Grout Sealer: Non-flammable, water-soluble, penetrating methyl siliconate clear solution, stain-resistant, matte sealer.

G. Tile, Grout and Masonry Cleaner: As approved by the tile, grout and sealer manufacturers.

2.7 MORTAR AND GROUT MIX

A. Mix and proportion mortar and grout materials in strict accordance with the manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates slope to drains and conditions are as required, and ready to receive the work.

1. Examine areas to be covered for surface contamination which requires correction before work begins.

C. Report in writing, prevailing conditions that will adversely affect satisfactory execution of

the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Do not use sealers or curing compounds on concrete slabs to be covered with tile. Slabs shall be covered and wet cured for a minimum of seven (7) days. Surfaces to receive tile installed by the thin set method shall have a wood float finish, be true to within 1/8" in 10 feet, and pitched to drains where required.

B. Areas requiring fill, patching or leveling shall be prepared by the General Contractor. Do not use gypsum or asphalt leveling compounds.

C. Seal substrate surface cracks with filler.

D. Clean substrate surfaces to remove dust, dirt, mortar, etc.

E. Surfaces to be covered shall be left clean, free of dust, plaster, sealer or curing compounds and form oil. Any such contamination shall be removed by the responsible trade.

F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

G. Protect surrounding work from damage or disfiguration.

H. Vacuum clean existing substrate and damp clean.

I. Wet down or wash and remove excess water from dry or dusty concrete or masonry surfaces just prior to the application of pavers.

3.3 INSTALLATION

A. Installation Methods: Install ceramic tile in accordance with the TCA, "Handbook for Ceramic Tile Installation", ANSI A108.4, and ANSI A108.5.

B. Waterproof Membrane: Install waterproof membrane for all elevated slab floors exposed to water or wind blown rain. For example, install at elevated slabs where Showers, Baths, Kitchens, washing and other wet activities occur; and at terraces and roofs over interior spaces.

1. Contractor shall obtain architect or owner's representative approval of membrane prior to proceeding with the work.

C. Installation by Thin Set Method:

1. Apply mortar with a notched trowel using a scraping motion to work the material into good contact with the substrate to be covered. A trowel having notches approximately 1/4" x 3/8" is recommended for pavers. Apply only as much mortar as can be covered within 30 minutes, or while the surface is still tacky.

2. Trowel a small quantity of mortar onto the back of each piece of tile. Set the tile in place and tap with a small beating block to ensure 100% full bedding and a true surface.

3. Align tile to provide uniform joints and then allow to set until firm.

4. Clean excess mortar from the surface of tiles with a wet cloth or sponge while the mortar is still fresh.

D. Mortar:

1. Machine Mixing: Mortar mixer shall be the rotating blade type. Place mixing liquid in the mixer, start the machine and add sand, then cement. Mix only long enough to wet out the batch. Stop the mixer and dump the mortar promptly. Do not overmix.

2. Hand Mixing: Pre-mix the dry ingredients (sand and cement). Place mixing liquid in a clean container or mixing box, add the dry materials and mix. Adjust the amount of liquid or dry materials to obtain the proper consistency.

E. Joints: 1/8" width for tiles less than 12"; 3/16" for tiles to 25"; 1/4" for quarry tile.

F. Expansion and Control Joints:

1. Existing joints in concrete subfloors must be carried through the tile and shall conform to the architectural details.

2. Expansion joints shall be installed where tile abuts restraining surfaces, such as perimeter walls, curbs, columns, corners, etc.

3. Interior installations shall have expansion joints spaced a maximum of 30 feet o.c. in both directions. Exterior areas shall have expansion joints spaced a maximum of 15' in both directions. Expansion joints shall be raked out or cut through the setting bed to the supporting slab or structure below.

G. Edge Strips: Install at transitions to other flooring materials, for control joints, or as indicated.

H. Grouting and Pointing Joints:

1. Joints shall be grouted or pointed with Latex-Portland Cement Grout or Epoxy Grout.

2. Joints shall be packed full and free of voids and pits. Tool or rake as specified.

3. Excess mortar shall be cleaned from the surface of tiles with water and a damp sponge as the work progresses, while the mortar is fresh and before it hardens.

I. Provide a slope in tile setting material as required to slope surfaces at floor transitions and floor drains.

J. Lay tile to the pattern indicated. Do not interrupt the tile pattern through wall openings.

K. Cut and fit tile to penetrations through the tile leaving a sealant joint space. Form corners and bases neatly. Align floor, base, and wall joints.

L. Place tile joints uniform in width, subject to variance in the tolerance allowed in the tile size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

M. Sound the tile after setting. Replace hollow sounding units.

N. Expansion, Contraction, Control Joints and Separation: Install tile and a pair of metal edge strips in accordance with the applicable TCA Handbook methods. Keep joints free of adhesive, mortar, and grout; seal. Refer to Section 07900 - Joint Sealers.

O. Allow tile to set for a minimum of 48 hours prior to grouting.

P. Grout tile joints in accordance with ANSI A108.10.

Q. Caulk plumbing penetrations thru floor tiles and plumbing and electrical penetrations thru wall tiles.

R. Apply sealant to the junction of tile and dissimilar materials and at the junction of dissimilar planes as specified in Section 07900 - Joint Sealers. Apply in strict accordance with the manufacturer's instructions.

S. Install metal edge strips at transitions to other flooring materials, and where tile edges are exposed. Lock solidly into the setting bed.

3.4 INSTALLATION SCHEDULE

A. Ceramic Tiles: Install by thin set method. Place waterproofing membrane at Shower Rooms, areas on structural slabs subject to wind blown water and other wet areas.

3.5 TOLERANCE

A. Maintain an even and flat plane with variation not to exceed 1/8" in 8 feet. Adjacent tile shall be flush with no protruding or recessed tile edges. The tiles shall be cut neatly and fit to built-in work, penetrations, corners, changes in elevations and other variations.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect installations for joint widths, alignment, edge treatments, sound bonding to the substrates.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Upon the completion of placement and grouting, clean all ceramic tile surfaces free of foreign matter.

C. Remove excess mortar and grout from floor, base, and wall surfaces without damaging the surfaces.

D. Clean unglazed tiles with acid solutions only when permitted by the tile and grout manufacturer's printed instructions, but not sooner than fourteen (14) days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from the effects of acid cleaning. Flush surfaces with clean water before and after cleaning.

E. Clean tile only with cleaning materials recommended by tile and grout manufacturers.

F. Remove hardened grout film or haze using Laticrete TC-500, Grout and Masonry Cleaner.

1. Saturate grout joints with water, then dampen the surface with the cleaner.

2. Allow to soak 15 - 30 minutes and then use a power scrubbing machine with a coarse texture nylon pad to remove the grout film.

G. Clean unglazed pavers by sprinkling fine sand (30 - 60 mesh) over the surface before scrubbing.

1. Caution: Do not use sand on soft glazed tiles.

H. Do not use acid type cleaners on colored grout joints.

I. Leave finished installations clean and free of cracked, chipped, broken, un-bonded and otherwise defective work.

3.8 PROTECTION

A. When recommended by the tile manufacturer, apply a protective coat of neutral protective cleaner to the completed floor and wall tiles.

B. Protect installed tile work with kraft paper or other heavy covering to prevent staining, damage and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven (7) days after grouting has been completed.

D. Immediately before final inspection, remove the protective coverings and rinse the neutral cleaner from the tile surfaces.

E. Before final inspection, remove protective coverings and rinse neutral cleaner from the tile surfaces.

END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Suspended metal grid ceiling system.

2. Perimeter trim.

3. Acoustical ceiling panels, suspended.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 07900 - Joint Sealers: Caulking of joints between perimeter trim and vertical surfaces.

2. Section 15850 - Air Outlets and Inlets: Air diffusion devices in the ceiling system.

3. Section 16510 - Interior Luminaires: Light fixtures attached to the ceiling system.

1.2 DESCRIPTION OF WORK

A. The extent of acoustical ceilings work is indicated on the Drawings and as specified herein, and includes providing and installing suspended metal ceiling grid, perimeter trim, acoustical panels, hanger devices, sealants and accessories for complete adhered and suspended ceiling systems.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 641 - Specification for Zinc-Coated (Galvanized Carbon Steel Wire.

2. ASTM C 635 - Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

3. ASTM C 636 - Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

4. ASTM D 1779 - Specification for Adhesive for Acoustical Materials.

5. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

6. ASTM E 400 - Test Method for Analysis of Ores, Minerals, and Rocks by the Fire Assay Preconcentration Optical Emission Spectroscopy.

7. ASTM E 413 - Classification for Rating Sound Insulation.

8. ASTM E 580 - Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

9. ASTM E 795 - Practices for Mounting Test Specimens During Sound Absorption Tests.

10. ASTM E 1264 - Classification for Acoustical Ceiling Products.

C. International Building Code (IBC):

1. Applicable edition in the Project jurisdiction.

1.4 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

1. Product Data: Manufacturer's product specifications and installation instructions for each suspension system and type of seismic brace, and each acoustical ceiling material required; certified laboratory test reports and other data as necessary to show compliance with these Specifications.

2. Shop Drawings: Four (4) sets of accurate layout drawings based on actual field measurements. Indicate all mechanical and electrical items, access panels and other items to be installed in the finished ceiling including seismic bracing locations.

3. Samples:

a. Two 6" x 6" square samples of each acoustical unit required, showing the full range of exposed pattern, texture and color to be expected in the finished work.

b. Two 12" long samples of each exposed runner.

c. Two 12" long samples of each edge molding.

4. Assurance / Control Submittals.

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

5. Maintenance Information: Manufacturer's recommendations for cleaning and refinishing acoustical units, including precautions against materials and methods which may be detrimental to finishes and acoustical performance.

B. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

1. Warranty: Submit a written special Warranty with forms completed in the name of the Owner and registered with the manufacturer.

1.5 COORDINATION

A. Coordinate layout and installation of the suspension system components and acoustical ceilings with other work supported by or penetrating through the ceilings, including light fixtures, HVAC equipment, fire-suppression system components, and partition systems, if any.

B. Furnish layouts for inserts, clips and other supports required to be installed by other trades for support of acoustical ceilings.

1. Furnish concrete inserts, steel deck hanger clips and similar devices to other trades for installation well in advance of the time needed for the coordination of other work.

C. Interface with Other Work:

1. Schedule the installation of acoustical units after all interior wet work has been completed.

2. Install after all major above ceiling work has been completed.

3. Coordinate the location of hangers with other work.

4. Do not install acoustical units until after the building has been enclosed, dust generating activities have ceased, overhead work is complete, tested and approved and the air conditioning system is operational.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience; acceptable to the manufacturer as shown by a current written statement from the suspension system manufacturer.

C. Fire Performance Characteristics: Provide acoustical ceiling components identical to those tested for the following fire performance characteristics, according to the ASTM test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify the acoustical ceiling components with appropriate marking by the testing and inspecting agency.

1. Surface Burning characteristics: Tested per ASTM E 84.

a. Flame Spread: 25 or less.

b. Smoke Developed: 50 or less.

D. Fire Resistance Ratings: As indicated by reference to the design designation in UL "Fire Resistance Directory" or "FM Approval Guide" for floor, roof or beam assemblies in which acoustical ceilings function as a fire protective membrane, tested per ASTM E 119.

E. Fire-Rated Ceilings: Provide protection materials for lighting fixtures and air ducts to comply with the requirements indicated for a rated assembly; conform to UL requirements for materials and assemblies. Provide UL Design No. P 251 enclosures over all types of recessed lights.

F. Limitations: The ceiling and suspension system shall be installed with vertical and lateral seismic bracing as required by the building code. Ceilings shall not support materials or other building components. Ductwork, grilles, light fixtures, plumbing and like work shall have their own support system and shall not use the ceiling system or ceiling suspension wires for support.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Deliver products to the Project Site in the manufacturer's original, unopened containers, dry and undamaged, with the brand name and type clearly marked.

C. Store under cover in dry, weathertight conditions.

D. Protect against damage from moisture, direct sunlight, surface contamination and other causes.

E. Handle acoustical ceiling units carefully to prevent chipping of edges and damage to the units in any way.

1.8 JOB CONDITIONS

A. Do not install acoustical ceiling units until the space has been enclosed and weatherproof, wet work in the space is completed and nominally dry, work above the ceiling is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

B. Maintain a uniform temperature range of 60° - 85° F and relative humidity of no more than 70%, continuously, prior to, during and after installation.

1.9 WARRANTY

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Special Warranty:

1. Provide a written Warranty jointly signed by the manufacturer and the installer certifying that the products and the installation is free of defective materials and workmanship and will repair or replace any defective component or the system, in whole or in part, as necessary to restore the product to its original intended state and integrity.

2. Warranty Period: Ten (10) years from the date of Substantial Completion, subject to conditions.

1.10 MAINTENANCE

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Extra Materials: Provide not less than 5% of each type, size and color of acoustical ceiling panels, from the same manufacturer as the materials installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Suspension System: Subject to compliance with the Project requirements, manufacturers offering specified items which may be incorporated into the work include the following:

1. Armstrong Building Products (Armstrong World Industries, Inc.).

2. Chicago Metallic Corp.

3. USG Interiors, Inc. (USG Corp.).

B. Acoustical Panels: Subject to compliance with the Project requirements, manufacturers offering the specified items which may be incorporated into the work include the following:

1. Armstrong World Industries, Inc.

2. USG Interiors.

3. Celotex Building Products Division (CertainTeed).

C. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 METAL CEILING GRID SUSPENSION SYSTEMS, GENERAL

A. Standard for Metal Suspension Systems: Intermediate duty, hot-dipped galvanized steel suspension grid of the type and finish indicated; comply with applicable requirements of ASTM C 635.

B. Edge Moldings and Trim: Metal or extruded plastic of the types and profiles indicated, or if not indicated, provide manufacturer's standard molding for edges and penetrations of the ceiling which fits with the type of edge detail and suspension system indicated.

1. For lay-in panels with reveal edge details, provide a stepped edge molding which forms a reveal of the same depth and width as that formed between the edge of panels and flanges at exposed suspension members.

2. For circular penetrations of the ceiling, provide edge moldings fabricated to the diameter required to fit the penetration exactly.

C. Finishes and Colors: Provide manufacturer's standard finish for the type of system indicated, unless otherwise required. For exposed suspension members and accessories with painted finish, provide the color indicated or, if not otherwise indicated, as selected from the manufacturer's full range of standard colors.

1. High Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance".

D. Attachment Devices: Size for five (5) times the design load indicated in ASTM C 635, Table 1, Direct Hung.

1. Concrete Inserts: Inserts formed from hot-dipped galvanized sheet steel and designed for attachment to concrete and for embedment in concrete, with holes or loops for attachment of hanger wires.

2. Surface Devices: Standard, hot-dipped galvanized, angle hangers, shot stud attached to concrete ceilings.

E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretched, Class 1 coating, sized for three (3) times the hanger design load indicated in ASTM C 635, Table 1, Direct Hung; not less than 12 gage for vertical hangers and lateral sway bracing.

F. Stiffner Braces: Manufacturer's standard vertical struts or attachment to hanger wires to hold the suspension system in place during seismic events.

G. Hold-Down Clips for Non-Fire-Rated Ceilings: For exterior ceilings and for interior ceilings with lay-in panels weighing less than one pound per square foot, provide hold-down clips spaced at 2'-0" o.c. on all cross tees.

2.3 EXPOSED METAL CEILING GRID SYSTEM

A. Intermediate duty, hot-dipped galvanized steel, exposed AT@; 15/16" wide; one-hour fire rated; plug-in positive-lock connections, locking tee ends, main tees punched with cross tee and hanger wire holes, stabilizer bars, clips and splices, baked on paint finish; ASTM C 635. Color white, unless selected otherwise.

1. Model:

a. Prelude XL 15/16", Exposed Tee System by Armstrong.

b. 1200 Seismic System by Chicago Metallic Corp.

c. Donn Brand DX / DXL System by USG.

2. Moldings: [Angle] [Shadow] molding with exposed flange to match the grid system. Color to match the grid.

3. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.4 CONCEALED METAL CEILING GRID SYSTEM

A. Intermediate duty, hot-dipped galvanized steel, concealed, 15/16" wide, one-hour fire rated; plug-in positive lock connections, locking tee ends; ASTM C 635.

1. Model:

a. Prelude Concealed Tee System by Armstrong.

b. Donn Brand DXL, Concealed Ceiling Suspension System by USG.

2. Moldings: [Angle] [Shadow].

3. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.5 ACOUSTICAL CEILING UNITS, GENERAL

A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of the configuration indicated which are prepared for the mounting method designated and which comply with the requirements of ASTM E 400, including those indicated by reference to type, form, pattern, grade, noise reduction coefficient (NRC), ceiling attenuation class (CAC), light reflectance (LR), edge detail, and joint detail, if any.

1. Mounting Method for Measuring NRC: No. 7 (mechanically mounted on special metal support), ASTM E 400 mounting per ASTM E 795.

B. Sound Attenuation Performance:

1. Provide acoustical ceiling units with ratings for ceiling attenuation class (CAC) values of the range indicated as determined in accordance with ASTM E 413.

2. Provide acoustical ceiling units with ratings for ceiling sound attenuation class (STC) of the range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of a type appropriate for ceiling units of the configuration indicated (concealed for tile, exposed for panels).

C. Colors, Textures, and Patterns: Provide products to match the appearance characteristics indicated or, if not otherwise indicated, as selected from the manufacturer's standard colors, surface textures, and patterns available for acoustical ceiling units and exposed metal suspension system members of the quality designated.

2.6 ACOUSTICAL CEILING UNITS

A. General: The following product type numbers in parenthesis are those used on the Drawings.

B . (ACT-1): Mineral fiber, fire-resistant, Class A: flame spread 25 or less per ASTM E 1264, R-1.6, weight 1.0 lbs / sf, factory-applied vinyl latex paint finish, fine texture, non-directional, NRC .50 -.60, CAC 30 - 40, LR 0.80, angled tegular edge, 24" x 24" x 5/8". Color as selected.

1. Ultima Health Zone by Armstrong.

2. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.7 MISCELLANEOUS MATERIALS

A. Tile Adhesive: Type recommended by the tile manufacturer, bearing UL label of Class 0 - 25 flame spread; comply with ASTM D 1779.

B. Tile Fasteners: Cadmium plated, type recommended by the tile manufacturer, length for not less than 1/2" penetration of substrate.

C. Acoustical Sealant: Resilient, non-staining, non-shrinking, non-hardening, non-skinning, non-drying, non-sag sealant intended for interior sealing of concealed construction joints.

1. Tremco Acoustical sealant by Tremco Global Sealants.

2. USG Acoustical Sealant by United States Gypsum Co.

3. Chem-Calk 600 by Bostik.

4. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

1. Verify that the layout of hangers will not interfere with other work.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Layout:

1. Locate the system on room axes according to the Reflected Ceiling Plan, as indicated on the Drawings, or establish layout to balance the border tile widths at opposite edges of each ceiling. Avoid the use of less than 1/2 width units at borders.

2. Where the acoustical ceiling continues thru a wall opening, continue the established pattern without interruption. One row of panels may be cut to less than full size, if necessary, to establish the pattern in the adjoining room.

B. Substrate Testing: Before installing adhesively applied tile on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that the moisture level is below the tile manufacturer's recommended limits.

C. Prior to installation, store acoustical units for 24 hours, minimum, at the same temperature and relative humidity as the space where the materials are to be installed.

3.3 INSTALLATION - GENERAL

A. Install materials in accordance with the manufacturer's printed instructions, ASTM C 635 and ASTM C 636, in compliance with governing regulations, fire-resistance rating requirements as indicated, and industry standards applicable to the work.

3.4 INSTALLATION - CEILING SUSPENSION SYSTEM

A. General:

1. Install the suspension system with hangers supported only from the building structural members. Locate hangers not less than 6" from each end and spaced

at 4'-0" o.c. along each carrying channel or direct-hung runnner, unless otherwise indicated.

2. Install metal hanger tabs and clips attached to the structure above where required for the attachment of suspension wires.

3. Secure wire hangers by looping and wire-tying, either directly to the structure or to inserts, eye-screws, or other devices which are secure, appropriate for the substrate, and which will not deteriorate or fail with age or temperature change.

4. Install hangers plumb and free from contact with insulation, ductwork and other objects within the ceiling plenum which are not part of the supporting structure or ceiling suspension system. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing. Where carrying members are spliced, avoid visible displacement of the face plane of adjacent members.

5. Install edge molding of the type indicated, at the perimeter of acoustical ceiling areas, at the intersection of the ceiling and vertical surfaces and at locations where necessary to conceal the edges of acoustical units. Use the longest practical lengths. Provide edge molding at junctions with other interruptions. Secure at 16" o.c., maximum.

6. Screw-attach moldings to the substrate at intervals not over 16" o.c. and not more than 3" from ends; level with the ceiling suspension system. Miter corners accurately and connect securely.

7. Rivet cross tee's to the edge molding at 48" o.c., typical.

8. In areas larger than 144 sq. ft., rivet the cross tees on two adjacent walls per ASTM E 580.

9. Do not support components on the main runners or cross runners if the weight causes the total dead load to exceed the allowable limits. Do not eccentrically load the system or produce rotation of runners.

10. Install the system level, in a uniform plane, and free of twists, warp, dents, scratches, stains and other defects. Variation from Flat and Level Surface: 1/8" in 12 feet.

11. Caulk between the edge molding and adjacent vertical surfaces.

B. Vertical Support System:

1. Suspension wires shall be 12 gage, minimum, galvanized, attached to main runners at 4'-0" o.c., maximum, spacing in both directions.

2. Each wire shall be anchored to the structure above with a device capable of supporting 75 pounds, minimum.

3. Wires supporting fixtures shall be capable of supporting four (4) times the fixture weight.

4. Suspension wires shall not hang more than 1:6 out of plumb, unless counter sloping wires are provided.

5. Wires shall not be attached to or bend around interfering work such as piping, conduits or ductwork. Trapeze or equivalent devices shall be used where obstructions interfere with direct suspension. Trapeze shall be suspended back-to-back, 1-1/2" cold formed channels, minimum, for spans up to 6 feet.

C. Horizontal Support System:

1. Lateral support systems for ceilings shall be shown in detail on the Shop Drawings.

2. Adequacy of the system shall be demonstrated by calculations, and / or test results, including adequacy of main runner intersection connections. Tests shall show a capacity of twice the calculated load to provide a safety factor.

3. Provisions shall be made for possible differential movement between ceilings and side walls. The terminal ends of each main and each cross runner shall be wire supported. Wall trim angles shall not provide the primary support for runners.

4. Lateral support of ceilings shall not be provided by the angle trim, and runners shall not be riveted to the wall trim.

D. Lateral Force Bracing: Provide cross-bracing for ceilings greater than 144 sq. ft. in area.

1. Where substantiating calculations are not provided, horizontal restraints shall be provided by four No. 12 gage wires secured to a main runner within 2" of a cross runner intersection and splayed 90 degrees from each other at an angle not exceeding 45 degrees from the plane of the ceiling. A strut fastened to the main runner shall extended up to and be fastened to a structural member supporting the roof or floor above. The strut shall be adequate to resist the vertical force induced by the bracing wires. These horizontal restraint points shall be placed 12 feet o.c. in both directions with the first point within 6 feet of each wall. Attachment of the restraint wires to the structure shall be adequate for the load imposed.

3.5 INSTALLATION - ACOUSTICAL PANELS

A. Arrange acoustical units and orient directionally patterned units, if any, in the manner shown on the Drawings. If not indicated, install units with the pattern running in one direction only, as approved by the Owner's representative.

B. Fit the acoustical units in place free of damaged edges, dents, scratches, stains and other defects; install level and in a uniform plane.

C. Hold Down Clips: For fire-rated and security areas, install clips spaced at 2'-0" o.c. on all cross tees. Do not install clips at panels for access and at one panel in each corner of a room.

D. Mark access panels with a black adhesive dot.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect the ceiling grid suspension system installation, connections to the structure, edge moldings and acoustical panel placement.

3.7 ADJUSTING

A. Section 01700 - Execution Requirements: Adjusting the installed work.

B. Adjust the grid for alignment and level.

C. Adjust the acoustical panels for proper fit within the grid.

3.8 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Clean exposed surfaces of the ceiling grid, perimeter trim, and acoustical panels.

C. Comply with the manufacturer's instructions for cleaning and touch-up of minor finish damage.

D. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet vinyl flooring.

2. Resilient edge strip.

3. Accessories.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

C. Related Sections:

1. Section 09250 - Gypsum Board: Substrate for wall base.

1.2 DESCRIPTION OF WORK

A. The extent of resilient flooring work is indicated on the Drawings and Schedule and as specified herein, and includes providing and installing adhesively applied vinyl composition tile, sheet vinyl flooring, resilient edge strips, rubber base and resilient accessories.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM E 648 - Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

2. ASTM E 662 - Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

3. ASTM F 1066 - Specification for Vinyl Composition Floor Tile.

4. ASTM F 1303 - Specification for Sheet Vinyl Floor Covering with Backing.

1.4 SUBMITTALS

A. Section 01330 - Submittal Procedures: Procedures for submittals.

1. Product Data: Technical data and installation instructions for each type of resilient flooring and accessory.

a. Two boxes - 2" x 2" samples of each type, color and pattern in the specified group of the manufacturer selected for each type of resilient flooring required.

b. 12" x 12" samples of sheet flooring.

c. Samples of available colors for resilient edge strip.

3. Final Samples: Submit for final selection.

a. 2 - 12" x 12" samples of sheet flooring.

b. 2 - 6" long sections of resilient edge strip.

4. Assurance / Control Submittals:

a. Manufacturer=s certificate that the products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

5. Maintenance Instructions: Submit two (2) copies of the manufacturer=s recommended maintenance practices for each type of resilient flooring and accessory required.

3. Product Data: For low-emitting materials, indicating compliance with low emittance standards and requirements.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Installer: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Regulatory Requirements:

1. Critical Radiant Flux in Accordance with ASTM E 648: More than 0.45 watts per square centimeter.

2. Specific Optical Smoke Density in Accordance with ASTM E 662: Less than 450.

C. Where possible, provide each type of resilient flooring and accessories as the products of a single manufacturer, including recommended primers, adhesives, and sealants.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store and protect the products.

B. Deliver products to the Project Site in the manufacturer's original, unopened cartons and containers, each bearing the name of the product and manufacturer, project identification, and shipping and handling instructions.

C. Store the materials in a dry space, protected from the weather, with ambient temperatures maintained between 50☜ and 90☜ F.

D. Store on a flat surface.

1.7 JOB CONDITIONS

A. Environmental Requirements:

1. Do not install flooring over concrete slabs until the slabs have been cured and are sufficiently dry to achieve bond with the adhesive, as determined by the manufacturer=s recommended bond and moisture tests.

2. Store materials in the area of installation for at least 48 hours prior to beginning installation.

3. Maintain the ambient temperature required by the adhesive manufacturer, not less than 72☜ F, for three days prior to, during, and for 48 hours after installation.

4. Install flooring and accessories only after other finishing operations, including painting, have been completed.

5. Provide adequate temporary ventilation during installation.

1.8 MAINTENANCE

A. Section 01780 - Closeout Submittals: Procedures for closeout submittals.

B. Extra Materials: At completion of the installation deliver to the Project Site extra materials from the same manufactured lot as the materials installed in the following quantities:

1. Not less than 2% of each type, size and color of flooring.

2. Submittal of extra accent tiles is not necessary.

C. Maintenance Data: Submit two (2) copies of manufacturer=s recommended maintenance practices for each type of flooring and accessory required, recommended maintenance materials and suggested schedule for cleaning.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering the specified items which may be incorporated into the work include the following:

1. Sheet Vinyl:

a. Armstrong Floor Products (Armstrong World Industries, Inc.).

b. Azrock.

c. Tarkett.

2. Resilient Edge Strip:

a. Armstrong Floor Products.

c. Roppe.

d. Burke Mercer.

B. Colors, patters and sizes shall be selected from the manufacturer=s standards.

C. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

A. Sheet Vinyl Flooring (SV-1): Randomly placed, high-contrast colors to create a terrazzo-like pattern; ASTM F 1303 Class A backing, Grade 1, Type II, flexible fiberglass; 6 feet wide; nominal 0.080A overall gage, 0.050" nominal wear layer; modified static load limit 500 psi; as follows:

1. Connection Corlon by Armstrong.

2. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

B. Resilient Edge Strip: Homogeneous vinyl, tapered or bullnose edge, 1/8" thick x not less than 1" wide x length required or roll length. Color as selected.

2.3 ACCESSORIES

A Subfloor Filler: Latex underlayment mixed with undiluted latex liquid, furnished by or as recommended by the resilient flooring manufacturer as follows:

1. Levelayer I by Dayton Superior Corporation.

2. No. 345 by W.W. Henry Company.

3. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

B. Concrete Slab Primer: Non-staining type as recommended by the resilient flooring manufacturer.

C. Adhesive: As recommended by the resilient flooring manufacturer for the specific material and substrate conditions; clear color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory execution of the work of this Section. Do not proceed with the work until the unsatisfactory conditions have been corrected.

D. Start of the flooring installation shall indicated acceptance of the subfloor conditions and full responsibility for the completed work.

3.2 PREPARATION

A. Remove existing floor finishes and prepare substrate as recommended by the resilient flooring manufacturer.

B. Remove curing compounds not compatible with the adhesive. Avoid organic solvents.

C. Remove ridges, bumps and other irregularities in the substrate.

D. Fill cracks, joints, holes and depressions with a subfloor filler and leveler recommended by the flooring manufacturer to achieve a smooth, flat, hard surface, with no more than 1/8" variation from plane within 10 feet in any direction.

E. Prohibit traffic until the filler has cured.

F. Broom clean and vacuum surfaces to be covered by resilient flooring; inspect the subfloor.

G. Perform bond and moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured, dried and are ready to receive the flooring Utilize a bond test recommended by the flooring manufacturer. Ensure that moisture content of the concrete substrate does not exceed 3% as measured by the Calcium Carbide Hygrometer Procedure or 5% by normal Protimeter.

H. If bond test is negative, surface the existing floor with latex underlayment as recommended by the manufacturer.

I. Apply concrete slab primer, if recommended by the flooring manufacturer, prior to the application of adhesive. Apply in compliance with the manufacturer=s instructions.

3.3 INSTALLATION - GENERAL

A. Install resilient flooring using the methods indicated, and in strict compliance with the manufacturer=s recommendations.

B. Maintain subfloor reference marks, penetrations, and openings that are in place or plainly marked for future cutting by repeating on the finished flooring. Use chalk or other non-permanent marking device.

C. Cut flooring to and fit around all permanent fixtures, built-in furniture, cabinets, pipes, and outlets. Cut edges, and fit and scribe to walls and partitions after the field flooring has been installed.

D. Extend flooring into toe spaces, door rabbets, closets and similar openings.

E. Tightly cement flooring to the subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

F. Install flooring on covers for telephone and electrical ducts, and other such items that occur within finished floor areas; maintain overall continuity of colors and patterns with pieces of

flooring installed in the covers. Tightly cement edges to the perimeter of the floor around the covers and to the covers.

G. Hand roll flooring at the perimeters of each covered area to ensure proper adhesion.

3.4 INSTALLATION - SHEET VINYL FLOORING

A. Layout sheet flooring for as few seams as possible with economical use of materials.

B. Match edges for color, pattern and shading at seams in compliance with the manufacturer=s recommendations.

C. Prepare seams in the sheet flooring in accordance with the manufacturer=s instructions for the most inconspicuous appearance. Seal continuously with fluid applied sealant or adhesive as standard with the manufacturer.

D. Adhere sheet flooring to the substrate using a method approved by the flooring manufacturer for the type of sheet flooring and substrate conditions.

E. Use conventional perimeter bonding adhesive procedures where recommended by the flooring manufacturer. Use special perimeter bonding adhesive for unfilled vinyl sheet with vinyl backing.

3.5 INSTALLATION - RESILIENT EDGE STRIP

A. Install edge strips at unprotected and exposed edges where resilient flooring terminates and where flooring terminates at points higher than the contiguous finished flooring, except at doorways where thresholds are located.

B. Place resilient edge strips tightly butted to the resilient flooring. Secure with adhesive to the flooring and substrate.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. Inspect the resilient flooring and base installation, pattern, layout and attachment to the substrate.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. Remove excess adhesive and other surface blemishes from the floor finish, base and wall surfaces without damage; use neutral type cleaners recommended by the flooring manufacturer.

C. Just prior to final inspection, thoroughly clean the flooring, edge trims and base.

D. Apply polish and buff. Use the type of polish, number of coats, and buffing procedures in compliance with the flooring manufacturer=s instructions.

3.8 PROTECTION

A. Protect installed flooring with heavy Kraft paper or other covering until final acceptance inspection.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior and exterior paint systems.

2. Schedule of Items to be painted.

3. Painting Treatments Schedule.

B. Related Documents: The Contract Documents, as defined in Section 01010 - Summary of Work, apply to the work of this Section. Additional requirements and information necessary to complete the work of this Section may be found in other Documents.

1.2 DESCRIPTION OF WORK

A. The extent of the work of this Section is indicated on the Drawings and Schedules and as specified herein, complete, and includes cleaning and preparation of all interior and exterior surfaces to be painted or finished, and finishing of all interior and exterior surfaces, unless hereinafter excluded.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. Publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

1.4 GENERAL

A. The term “Paint” as used herein, means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as primer, intermediate coat or finish coat.

B. The following categories of work are included under other Sections of these Specifications:

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various Sections of structural steel, metal fabrications, hollow metal doors and frames, and similar items.

2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built

mechanical and electrical equipment or accessories is included under other Sections.

1.5 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals.

1. Product Data: Submit for each type of paint specified.

a. Manufacturer's technical information including paint analysis, and application instructions for each material proposed for use.

b. Painting Schedule listing the surfaces to be painted with cross reference to the specific painting and finishing system, and application. Identify each paint material by manufacturer's catalog number and general classification.

2. Samples:

a. Prior to beginning the painting work, the Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples of color and texture only for the Architect=s review. Provide a listing of materials and application for each coat of each finish sample.

b. Provide two (2) samples of each color and material on 8" x 12" hardboard, with texture to simulate actual conditions. Re-submit samples as requested by the Architect until acceptable color, sheen, and texture is achieved.

c. Provide two (2) 8" x 12" samples of natural and stained wood finish on actual wood surfaces. Label and identify each as to location and application.

d. Provide two (2) 8 " x 12" samples of masonry for each type of finish and color on concrete masonry, showing the filler, prime coat and finish coats.

3. Mock-Up: On actual wall surfaces and other interior and exterior building components, duplicate the paint finish of the prepared samples. Provide full-coat finish samples on at least 80 sq. ft. of surface, as directed, until the required color, sheen and texture is obtained; simulate the final lighting conditions for review of the work in-place.

4. Assurance / Control Submittals:

a. Manufacturer's certificate that the products meet or exceed the specified requirements.

b. Documentation of experience indicating compliance with the specified qualifications requirements.

c. Manufacturer's Material Safety Data Sheets (MSDS) for each paint type specified.

1.6 COORDINATION

A. Pre-Application Meeting: Convene a Pre-Application Meeting at the Project Site prior to beginning the painting work.

1. Require attendance of the Contractor, Owner=s representative, Architect, representatives of the paint subcontractor and other finish products, and the mechanical and electrical trades.

2. Review coordination and environmental controls required for the proper application and ambient conditions in the areas to receive paint.

3. Review preparation and installation procedures, and the coordination and scheduling required with the painting work.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the products specified with a minimum of five (5) years documented experience.

2. Applicator: Company experienced in performing the work of this Section with a minimum of five (5) years documented experience.

B. Regulatory Requirements:

1. Surface Burning Characteristics in Accordance with ASTM E 84 for Class I or A finish:

a. Flame Spread (Non-Combustible Surfaces): Less than 25.

b. Smoke Density (Non-Combustible Surfaces): Less than 450.

2. Provide paint and coating materials that conform to Federal, and local Government restrictions for volatile organic compounds (VOC) content.

C. Codes and Standards: The work and materials shall conform to regulations of the Fire Department, safety color coding in conformance with OSHA and all other regulatory ordinances having jurisdiction. Conform to the most stringent requirements of the authorities having jurisdiction.

D. Single Source Responsibility: Provide primers and other undercoat paint products by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within the recommended limits.

E. Coordination of Work: Review other Section of these Specifications in which prime paints are to be provided to ensure compatibility of the total coating system for various substrates. Upon the request of other trades, furnish information or characteristic of the finish materials provided for use, to ensure that compatible prime coats are use.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect the products.

B. Deliver products to the Project Site in the manufacturer=s original, new and unopened packages and containers bearing the following information:

1. Manufacturer's name.

2. Name or title of the material.

3. Manufacturer's lot number and date of manufacture.

4. Contents by volume for major pigment and vehicle constituents.

5. Color name and number.

6. Thinning or reducing instructions.

7. Application instructions including surface preparation and coverage.

8. Drying time.

9. Cleanup requirements.

C. Store products, not in actual use, in tightly covered containers, off the ground and under cover. Maintain containers used in the storage of paint, in a clean condition, free of foreign materials and residue.

D. Store paint materials at a maximum ambient temperature of 90° F, in a ventilated area, and in compliance with the manufacturer's published instructions.

E. Keep storage areas neat and orderly. Remove oily rags and waste daily.

F. Protect against fire hazards and spontaneous combustion.

G. Take all precautions to ensure that workmen and the work areas are adequately protected from health hazards that might result from handling, mixing and application of paints.

1.9 JOB CONDITIONS

A. Environmental Requirements:

1. Do not apply paint during rain, fog or mist when the relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer=s printed instructions.

2. Apply paint finishes only when the moisture content of the surfaces to be coated is within the manufacturer's acceptable range for the type of finish to be applied.

3. Painting may be continued during inclement weather if the areas and surfaces to be painted are enclosed and within the humidity limits specified, and allowed by the paint manufacturer=s printed instructions.

4. Do not apply paint in areas where dust is being generated.

5. In areas being painted provide a lighting level of, at least 80 foot-candles, measured at mid-height of the surface being painted.

1.10 MAINTENANCE

A. Section 01700 - Contract Closeout: Procedures for closeout submittals.

B. Extra Materials:

1. Upon completion of the work, provide replacement materials from the same production run as the materials applied. Provide 2% of each, but not less than one (1) quart, nor more than ten (10) gallons of each type, color and sheen.

2. Label each container with the color, type and texture, in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Project requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Frazee Paint & Wallcovering.

2. Benjamin Moore & Co.

3. Sherwin-Williams Co.

4. Olympic Stains.

5. Watco Co.

6. ZAR by United Gilsonite Laboratories.

7. JASCO.

8. Thoro Systems Products.

9. PPG Amercoat (formerly Ameron Protective Coatings).

10. Textured Coatings of America, Inc. (TEX-COTE).

11. Rain Products Company.

B. Section 01600 - Product Requirements: Product Options: Substitutions permitted.

2.2 MATERIALS

A. Material Quality:

1. Manufacturer's best quality grade of the various types of coatings, and suitable for the intended purpose, as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer=s identification as a standard, best-grade product will not be acceptable.

a. Proprietary names used to designate colors or materials are not intended to imply that the products of the named manufacturers are required to the exclusion of equivalent products by other manufacturers.

B. Color Pigments:

1. Pure, non-fading, applicable types to suit the substrates and service indicated. Manufacturer shall confirm that exterior applied pigments will not fade when exposed to UV light.

2. All exterior colors and interior deep tone colors shall be ground-in at the factory. Shop mixing is not permitted.

3. Colors to be as selected by the Architect, and subject to modification on the Project Site at the Architect's discretion.

4. Lead content in pigment, if any, is limited to not more than 0.06%, based on the total non-volatile (dry film) of paint by weight. This limitation extends to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children.

C. Paint:

1. Ready-mixed, pigments fully-ground, maintaining a soft paste consistency, capable of readily and uniformly dispersing to a complete homogeneous mixture.

2. Provide good flowing and brushing properties, and capable of drying or curing free of streaks and sags.

D. Primers and Undercoaters: Produced by the same manufacturer as the intermediate and finish coats.

E. Paint Accessory Materials: Linseed oil, shellac, turpentine and other materials not specifically indicated herein, but required to achieve the finishes specified to be of high quality, and by an approved manufacturer.

2.3 PAINT SYSTEMS

A. (AFE) Interior Acrylic Flat Emulsion Copolymer: 100% acrylic latex, water thinned, washable, velvet flat finish, #002 Majestic by Frazee.

B. (AEE) Interior Acrylic Eggshell Enamel: 100% acrylic, water thinned, semi-gloss enamel, #022 Lo-Glo by Frazee.

C. (LOAE) No VOC Interior Acrylic Paint: Envirokote Interior Low Odor, flat, eggshell or semi-gloss as noted, with Envirokote primer by Frazee.

D. (AREM) Alkyd Resin Enamel for Interior and Exterior Metal: 628 Aro-plate II SG, semi-gloss with 661 metal primer by Frazee.

E. (EPC) Epoxy Paint for Cementitious Materials: Polyamide epoxy coating system, two-component coating self-priming, semi-gloss, Amerlock 400 by PPG Americoat.

F. (EPM) Epoxy Paint for Metal: 561 acrylic metal primer with Aro-Gard 542 finish coats, two-component coating, semi-gloss by Frazee. Prepare metal with JASCO Prep and Primer.

G. (RIP) Rust Inhibitive Primer: Alkyd mineral spirit thinned, satin finish primer; #661 metal prime, rust preventive alkyd primer by Frazee.

H. (PS) Primer Sealer: PVA vinyl acrylic resin, water-thinned, flat finish primer, #061 Aqua Seal interior PVA Sealer by Frazee.

I. (TEC) Cementitious Sealer: Elasto-grip FC, waterborne modified polyamine epoxy by Tnemec.

L. (TEC) Concrete Coating: Enviro-crete 156, modified waterborne acrylate by Tnemec.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting the work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive the work.

C. Report, in writing, prevailing conditions that will adversely affect satisfactory and timely execution of the work of this Section. State, in writing, any anticipated problems with using the specified coating systems on substrates primed by others. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.

D. Starting the painting work will be construed as the Applicator=s acceptance of the surfaces and condition within any particular area.

3.2 SURFACE PREPARATION

A. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

B. Perform preparation and cleaning procedures in accordance with the paint manufacturer's published instructions, and as herein specified, for each substrate condition.

1. Provide barrier coats over incompatible primers, or remove and reprime as necessary.

2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be field painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of the painting of each space or area, reinstall all removed items.

3. Clean surfaces to be painted before applying paint or surface treatment. Remove any oil or grease prior to mechanical cleaning.

4. Program cleaning and painting so contaminants from the cleaning process do not fall onto wet, newly painted surfaces.

C. Ferrous Metals: Clean ferrous surfaces not galvanized or shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.

1. Touch-up shop-applied prime coats where damaged or bare, when required by other Sections of these Specifications. Clean and touch-up with the same type of shop primer.

D. Galvanized Surfaces: Remove oil and other surface contaminants with a non-petroleum based solvent. Apply a coat of etching primer if required by the paint manufacturer.

E. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete blocks, cement plaster and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease and oils, and by roughening as required to remove glaze. Wash concrete surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush with clean water to neutralize the acid, and allow to dry before painting.

1. Determine the alkalinity and moisture content of surfaces to be painted by performing the appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of the finish paint, correct the condition before starting the application of paint.

2. Do not paint over surfaces where the moisture content exceeds that permitted in the manufacturer's printed instructions.

3. Clean floor surfaces, scheduled to be painted, with a commercial solution of muriatic acid, or other etching cleaner. Flush the floor with clean water to neutralize the acid, and allow to dry before painting.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with the manufacturer=s printed instructions.

B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.4 APPLICATION

A. General:

1. Apply paint products in accordance with the manufacturer's written directions

using applicators and techniques best suited for the substrate, type of material being applied, and texture required.

2. Paint finishes are scheduled. Provide prime coats compatible with the finish paints to be used.

3. Apply additional coats, when the undercoats, stains, or other conditions show through the final coat, until the paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment and furniture with prime coat only before final installation of the item.

5. Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.

6. Sand lightly between each succeeding enamel and varnish coat.

7. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

8. Apply each coat slightly darker than the preceding coat, unless otherwise approved by the Owner=s representative. Sand surfaces lightly between coats, as necessary to achieve the specified finish.

9. Do not apply finishes on surfaces that are not dry.

10. The number of coats and the film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured, as recommended by the paint manufacturer.

11. Paint the interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

12. Apply block filler to concrete masonry units at the rate necessary to provide complete coverage with pores filled.

B. Scheduling Painting: Apply first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until the paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spread rate to provide a total dry film thickness or, if not indicated, as recommended by the coating manufacturer.

D. Prime Coats: Apply a prime coat of material required to be painted or finished and has not been prime coated by others.

1. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in the first coat, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover surfaces to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness and other surface imperfections are not acceptable.

F. Surfaces To Be Painted: Except where natural finish of material is specifically noted as a surface to not be painted, paint exposed surfaces whether or not colors are designated. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials, or areas. If color or finish is not designated, the Architect will select from the manufacturer=s standard colors or finishes.

G. Equipment in Finished Rooms: Unless otherwise authorized, paint wall grilles and diffusers, door louvers, panel board fronts and other equipment having a factory-finish, occurring in rooms other than storage, mechanical and custodial.

H. Do not paint over any code-required labels, such as Underwriter=s Laboratories and Factory Mutual, or any other equipment identification, performance rating name, door label or nomenclature plates.

I. Paint exposed interior and exterior plumbing, heating and electrical equipment, apparatus, conduits, pipes and fittings, supports and hangers and all other unfinished surfaces of the mechanical and electrical work.

1. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primer or factory-painted metal surfaces of equipment installed under the mechanical and electrical work, except as otherwise indicated.

J. Mechanical and Electrical Work: Painting of mechanical and electrical work includes those items exposed in mechanical equipment rooms, in occupied spaces, and equipment on roofs.

1. Exposed Mechanical: Items to be painted include, but are not limited to, the following:

a. Factory pre-painted diffusers at public spaces.

b. Ductwork insulation.

c. Piping, pipe hangers and supports.

d. Sprinkler covers and piping.

e. Heat exchangers.

f. Motors, mechanical equipment and supports.

g. Tanks.

h Accessory items.

2. Exposed Electrical: Items to be painted include, but are not limited to the following:

a. Panel boards in public spaces.

b. Speaker grilles.

c. Conduit and fittings.

d. Switchgear.

e. Rooftop equipment.

K. Roof Flashings: Paint all exposed roof flashings that are not stainless steel or factory-finished.

L. Completed Work: Match the approved samples for color, sheen, texture and coverage. Remove, re-finish or re-paint work not in conformance with the specified requirements.

M. The following categories of work are not included as part of field-applied painting work.

1. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

2. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of prefinished aluminum, anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials do not require finish painting.

3. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkage, sinkage, sensing devices, motor and fan shafts will not require finish painting.

3.5 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Replace identification markings on mechanical and electrical equipment, if painted over or spattered.

B. Paint conduit and electrical equipment occurring in finished areas where exposed to public view, color and texture to match the adjacent surfaces.

C. Paint front, back and all edges of plywood backboards for electrical equipment before installing, and mounting the equipment.

3.6 FIELD QUALITY CONTROL

A. Section 01450 - Quality Control: Field inspection.

B. The Owner reserves the right to invoke the following material testing procedures at any time, and any number of times during the field painting work:

1. Engage the services of an independent testing laboratory to sample the paint being used. Samples of materials delivered to the Project Site will be taken, identified and sealed, and certified in the presence of the Contractor.

2. A testing laboratory will perform appropriate tests for any or all of the following characteristics: abrasion resistance, apparent reflectivity, flexibility, washability,

absorption, accelerated weathering, dry opacity, accelerated yellowness, re-coating, skinning, color retention, alkali resistance and quantitative materials analysis.

3. If the test results show that the material being used does not comply with the specified requirements, the Contractor may be directed to stop the painting work, remove the non-complying paint, pay for the testing, re-paint surfaces where the rejected paint has been applied, and remove the rejected paint from the previously painted surfaces if, upon re-painting with the specified paint, the two coatings are not compatible.

B. Inspect painting and coating applications for the scheduled materials, color, sheen, texture, thickness, and coverage.

3.7 CLEANING

A. Section 01700 - Execution Requirements: Cleaning the installed work.

B. As work proceeds, and upon completion, promptly remove paint where spilled, splashed, and spattered.

C. During progress of the work keep the premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris.

D. Remove from the site discarded paint materials, rubbish, cans and rags at the end of each work day.

E. Collect waste, cleaning cloths, and materials which may constitute a fire hazard, place in closed metal containers, and remove from the site daily.

F. Upon completion of the work leave the premises neat and clean. Clean metal door and window frames, glass, and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, taking care to not scratch or otherwise damage finished surfaces.

3.8 PROTECTION

A. Protect the work of other trades, whether to be painted or not, against damage by the painting and finishing work.

B. Place “Wet Paint” signs as required as a warning of newly painted surfaces.

C. Remove temporary protective wrappings provided by other trades for the protection of their work, after completion of the painting operations.

D. Upon completion of the work of other trades, touch-up and restore all damaged and defaced painted surfaces.

E. Correct any damage by cleaning, repairing or replacing and re-painting, as acceptable to the Owner's representative.

F. Repair any damage resulting from inadequate and unsuitable protection.

3.9 SCHEDULE OF ITEMS TO BE PAINTED

A. Refer to the Drawings and Painting and Finishing Schedule at the end of this Section for designated finishes. Paint finish shall be provided for, but not limited to, the following items:

1. Interior: All interior surfaces as scheduled on the Drawings including, but not limited to:

a. Metal opening frames and trim.

b. Gypsum board.

c. Exposed concrete and plaster.

d. Exposed mechanical ductwork , hangers and supports, if the exposed structure is shown on the Drawings to be painted.

e. Exposed piping, hangers and supports, if scheduled on the Drawings to be painted.

f. Exposed conduit, hangers and supports, if scheduled on the Drawings to be painted.

B. Do not paint the following Items:

1. Aluminum, brass, bronze, stainless steel and chrome-plated steel.

2. Pre-finished items, such as cabinetry, toilet compartments, acoustical ceiling materials, and mechanical and electrical equipment.

3. UL, FM, and other Code required labels.

4. Equipment identification, performance ratings, and name plates.

5. Finish hardware.

3.10 PAINTING TREATMENTS SCHEDULE

General: The paint abbreviations below refer to those noted above in PART 2, MATERIALS.

NO.	LOCATION	MATERIALS
1	Interior Smooth Concrete and Gypsum Board, where scheduled	Prime Coat: (PS) Finish: Two coats (AEE) or (AFE)
2	Interior Masonry, where scheduled	Prime Coat: (BF) Finish: Two coats (AEE) or (AFE)
3	Interior Concrete, Masonry and Gypsum Board, where noted for epoxy.	Prime Coat: As recommended by manufacturer Finish: Two coats (EPC)

4	Maintenance coating for interior smooth Concrete, Masonry, Gypsum Board and Wood	Prime Coat: As recommended by manufacturer Finish: (LOAE) Coats as required for coverage
5	Interior Metal including factory pre-finished items scheduled for painting	Prime Coat: (RIP) except where pre-finished Finish: Two coats (AREM)
6	Interior Metal where noted for epoxy	Prep Coat: JASCO Prep and Primer Prime Coat: Aro-Gard 561 primer Finish: Two coats (EPM)

END OF SECTION

SECTION 15000

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICATION

A. This section applies to all sections of Division 15.

1.2 LAWS, REGULATIONS AND CODES

A. All work shall be in accordance with government laws, ordinances, rules, regulations, and orders.

B. The Following Shall Govern Where Applicable: The 2009 International Building Code, The 2009 International Plumbing Code, The 2009 International Mechanical Code, The 2009 International Fire Code, Applicable National Fire Protection Association Standards, OSHA Rules and Regulations, and all other codes and standards referenced in these specifications. Where requirements differ in these codes and standards, the more stringent shall apply.

1.3 TRADE NAMES

A. Mentioning of a trade name indicates that the manufacturer is acceptable to the Engineer. However, certain specified construction and details may not be regularly included in the manufacturer's catalogued product. The Mechanical Contractor shall provide the material or equipment complete as specified.

1.4 AVAILABILITY OF EQUIPMENT AND MATERIALS

A. Specified equipment and materials may not be available locally and must be ordered off-island. This does not give Contractor the option to substitute non-complying materials or equipment that are locally available.

1.5 DEFINITIONS

A. "As directed" shall mean that the Mechanical Contractor shall seek instructions from the Architect.

B. "As indicated" shall mean as shown on plans.

C. "As necessary" shall mean that the item shall be provided if necessary to have all systems complete, tested, and ready for operation.

D. "Furnish" shall mean that the Mechanical Contractor shall furnish item indicated, installation will be done under another work.

E. "Mechanical Contractor" shall mean the Plumbing Contractor, the Air Conditioning Contractor, or the Fire Protection System Contractor.

F. "Provide" shall mean the Mechanical Contractor shall furnish and install item indicated.

G. "Or approved equal" used after a trade name shall mean that the trade name mentioned will be used as a basis of comparison and that all makes of similar item will be considered,

provided that, in the opinion of the Architect, substituted item has equal or better quality than the trade name mentioned.

H. "Or approved equivalent as manufactured by" shall mean that only products of manufacturers mentioned in the paragraph are acceptable to the Architect.

1.6 SUBMITTALS

A. Submit six sets of shop drawings, manufacturer's data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

1. Shop Drawings: Drawings shall be a minimum of 8.5 inches by 11 inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted.

2. Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.

3. Standards Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories (UL), proof of such conformance shall be submitted to the Architect for approval. If an organization uses a label or listing to indicate compliance with a particular standard, the label or listing will be acceptable evidence, unless otherwise specified in the individual sections.

4. Certificates of Conformance or Compliance: Submit certification from the manufacturer attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certification will not be acceptable; certifications shall be in the original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified.

B. Each submittal shall bear Contractor’s Certification that the material, equipment, and other

items in the submittal are in compliance with Contract Drawings and Specifications can be installed in allocated spaces.

C. Each submittal for equipment requiring electrical power supply shall also bear Contractor's Certification that the power requirements of the equipment in the submittal are consistent with the power supply shown on electrical drawings.

D. Any submittal without Contractor's Certification will be returned without review.

E. Coordination: Plumbing and Fire Protection Drawings shall be coordinated with air conditioning and ventilation drawings, offset piping around ducts, and offset ducts around structural members.

1.7 OPERATION AND MAINTENANCE MANUAL

A. For each equipment, furnish an operation and maintenance manual. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that equipment tests are performed, and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of the equipment or the building and the name of the Contractor. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operation; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.8 DELIVERY AND STORAGE

A. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation. Damaged or defective items shall be replaced.

1.9 CATALOGED PRODUCTS

A. Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number, and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.10 SAFETY REQUIREMENTS

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation of a type as specified herein.

1.11 MANUFACTURER'S RECOMMENDATIONS

A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.12 WORK INCLUDED IN OTHER SECTIONS

A. The following are included in the General Contract Work and all pertinent information required shall be provided by the Mechanical Contractor.

1. Access Doors and Panels: Concealed equipment, valves, and control devices shall be provided with access doors or panels of sufficient size to properly service or operate such items. Mechanical Contractor shall provide General Contractor with all locations and sizes of access doors and panels.

2. Concrete Pads or Runners for Equipment: Pads and runners shall be at least 6" above the floor, roof, or grade level and pads shall clear equipment base by at least 4" all around unless indicated otherwise.

3. Door Louvers and Undercutting of Doors.

4. Return Air Plenums: Ceiling spaces to be used for return air plenum shall be sealed air tight to prevent outside air and air above unconditioned spaces from getting into the plenum. Partitions and wall separating areas served by different air handling units using the ceiling spaces as return air plenum shall extend all the way up to the floor or roof slab above. All necessary work to accomplish these requirements shall be done under the General Contract Work. The Air Conditioning Contractor shall inspect return air plenums and report to the General Contractor, in writing, additional work to be done, if any, to meet these requirements. Copy of such report shall be furnished to the Engineer.

5. Roof Curbs: Roof curbs for ventilators, ducts, roof caps, or fresh air intakes shall be at least 8" higher than the adjoining roof and properly flashes. Flashing shall be done by the Mechanical Contractor.

6. Screened Louvers: Screened louvers on exterior walls shall be furnished by the Mechanical Contractor for installation by the General Contractor.

7. Toilet and Bathroom Accessories: Toilet and bathroom accessories such as paper holders, towel dispensers, and the like are specified under another section and will be provided under the General Contract Work.

8. Utilities: Cold water service line, sprinkler main, building sewer and storm sewer

main will be provided up to within 5 feet of the building line or as indicated. Final connection to these utilities shall be done by the Mechanical Contractor.

9. The following are included under Electrical Work

a. Power Wiring: All power wiring, including final hook-up to all mechanical equipment will be provided under the Electrical Work. Where control devices are required on power wiring such as a high temperature limit control for an exhaust fan, the control devices shall be installed by the Mechanical Contractor but shall be wired by the Electrical Contractor.

Division 16, ELECTRICAL WORK, is based on electrical ratings of equipment indicated on the mechanical drawings. Any deviation by the Mechanical Work which requires a change in the Electrical Work shall be paid for by the Mechanical Contractor.

b. Starters and Motor Control Center: The Mechanical Contractor shall furnish all starters and motor control centers where specified, for installation by the Electrical Contractor. The Mechanical Contractor shall turn over these items to the Electrical Contractor at site after receipt of notice from the Electrical Contractor that he is ready to install starters and motor control centers.

1.13 WORK TO BE DONE IN ACCORDANCE WITH OTHER SECTIONS

A. All electrical work and control wiring, included under Mechanical Work, shall be in accordance with Division 16, ELECTRICAL WORK.

B. Painting shall be done in accordance with the PAINTING Section of these specifications.

1. All ductwork exposed in finished areas shall be painted to match adjacent surface color. All piping exposed in finished areas shall be color coded in accordance with ANSI Standards.

2. All ductwork concealed in cabinets that may be exposed by opening of cabinet doors shall be painted to match adjacent surface color.

3. All exposed threads at joints of screw-jointed piping shall be painted.

4. All ferrous metals that have not been factory finish coated shall be painted, unless covered with insulation or embedded in concrete.

1.14 AS-BUILT DRAWINGS

A. The Contractor shall maintain at the site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Architect.

B. At the conclusion of the work, the Mechanical Contractor will be furnished by the Architect, at the Mechanical Contractor's expense, a set of reproducible made from original contract plans. The Mechanical Contractor shall then incorporate all changes made, as recorded, the set of reproducible in a clear, legible and reproducible manner. All underground stub-outs shall be dimensionally located from the building structure. As a condition for acceptance of work, "as-built" reproducible shall be signed by Mechanical Contractor

attesting that all changes have been incorporated, dated and delivered to the Architect.

C. As-built drawings required for

SECTION 15300 - FIRE PROTECTION SYSTEM
SECTION 15500 - AIR CONDITIONING, VENTILATION AND SMOKE REMOVAL SYSTEMS

--END OF SECTION --

SECTION 15245

VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work in this section includes, but is not necessary limited to, furnishing all labor, materials, and equipment of the installation of vibration isolation mounts, brackets, base frames where required, seismic restraints, flexible connectors, pipe isolation hangers, and ductwork isolation hangers. The installation shall be complete in every respect, tested, and adjusted to be in excellent working order.

1.2 RELATED WORK SPECIFIED ELSEWHERE IN WHOLE OR IN PART

A. Isolated HVAC Equipment including (but not limited to) Air Handlers, Fans, Pumps, Boilers, Chillers, Cooling Towers, Compressors, Piping, Ductwork.

B. Internally-isolated Equipment.

C. Plumbing Equipment including (but not limited to) Compressors, Pumps, Piping.

D. Electrical Equipment including (but not limited to) Transformers, Dimmers, Buses.

E. Concrete for equipment bases (housekeeping pads) and inertia blocks.

F. Flexible electrical connections to motors and vibrating equipment.

G. Flexible duct connections to fans and other vibrating elements.

H. Pipe suspension systems, connectors and couplings.

1.3 GENERAL REQUIREMENTS

A. Schedules: Consult vibration isolation schedule(s) in drawings or specifications for equipment types and required isolation devices including types, static deflections, bases, seismic restraints, etc. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated and the proper mounting and other devices shall be provided.

B. Equipment: Provide vibration isolators, base frames, inertia bases and seismic restraints of sufficient size and distribution to assure that deflection, stability and seismic restraint requirements are met. No fewer that four isolators shall be provided per equipment. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within ± 10% of specified deflection values.

C. Specific Manufacturer's equipment items are listed in this specification. All current and complete requirements from the listed manufacturer of these items shall be integral to this specification, unless such requirements conflict with requirements herein.

D. Adhere to Manufacturer’s Published Instructions.

E. Provide a visit to the job site before equipment is installed for the purposes of instruction. During the visit the manufacturer will inspect intended equipment locations and instruct installers in correct equipment installation procedure and sequence.

F. Short-Circuiting: Rigorously avoid shot-circuiting to the building any vibration isolated piece of equipment, pipe duct or other component. Short-circuits with or via rigid conduits, drain lines, rigid braces, rigid sleeves, framing, etc. all shall be avoided. The Contractor shall oversee trades to prevent the short-circuiting of any vibration isolation system and shall bring any unresolved conflicts to the Architect's attention.

G. Extra Parts: Supply and install any incidental equipment or parts needed to meet the requirements stated, even if not specified or shown on drawings, without claim for additional payment.

H. Package Units: Where equipment within Package Units is provided with separate isolators by the equipment manufacturer and the package enclosure is scheduled to be on an isolator assembly, the internal isolators shall be removed or permanently blocked and the isolated components they supported shall be rigidly attached to the enclosure.

I. Response to Punch List: Upon completion of the work, the Architect or Architect's representative will carry out an inspection of the project and of final project record documents and will inform the installing contractor of any further work that must be completed. Make all adjustments as directed by the Architect that result from this inspection. This work shall be dome before final acceptance of vibration isolation systems is given.

J. Corrective Work, Adjustment and Inspection:

1. Correct, at no additional cost to the Owner, all installations that are deemed defective in workmanship or materials by the Architect.

2. Obtain inspection and approval from the Architect of any installation to be covered or enclosed, prior to such closure.

3. After each equipment unit installation is complete and under full operational load, vibration isolators shall be adjusted so that loads are transferred to them and away from temporary blocking washers and shims. Blocks and shims then shall be removed and used as gauges to judge required clearances. Washers shall be moved away.

4. Inspect all vibration-isolated equipment, coordinate the work of all involved trades, and see that vibration isolators are not short-circuited by seismic restraints, drain lines, conduits, stanchions, control tubing, duct connections, pipe connections, etc. Ensure those hanger isolators and their rods or wires do not touch any other building component.

5. Schedule an inspection by isolation by isolation equipment manufacturer as required in Section 1. Obtain the required manufacturer's report and forward it to the Architect.

1.4 SPEED AND BALANCE REQUIREMENTS FOR ROTATING EQUIPMENT

A. Fans and other rotating mechanical equipment shall not operate at speeds in excess of

80% of their true critical speed.

B. Should any rotating equipment cause excessive noise or vibration, the Contractor shall be responsible for rebalancing, realignment, or other remedial work required reducing noise and vibration levels. Excessive is defined as exceeding the manufacturer's specifications for the unit in question, or exceeding the above displacement values.

1.5 SUBMITTALS

A. General: Comply with the provisions of Section 15000.

B. Within 35 calendar days after Award of Contract, submit the following:

1. A schedule indicating tag number, location and type of all vibration isolators. This shall be sufficiently clear to suffice as a checklist and index for information outlined below.

2. A complete tabulation showing for each vibration isolator:

a. the design load,

b. the static deflection expected under the design load,

c. specified minimum static deflection,

d. the additional deflection to solid under design load, and

e. the ratio of spring height to spring diameter under design load.

3. Details of seismic restraints, steel brackets, steel rails, steel base frames, and concrete inertia bases showing all steel work, reinforcing, and vibration isolator and seismic restraint mounting attachment methods.

4. Special details at large scale and all other necessary information to convey complete understanding of the work to be performed.

5. Calculations by a structural engineer licensed in the state in which the building is to be erected, certifying that all seismic restraints, bolts, cables and associated components will conform with the requirements of Section 2330, Earthquake Design, in the 1991 Uniform Building Code, will comply with other applicable local codes, and will resist a seismic acceleration in any direction of at least 0.5 G.

6. Written instructions and checklists to be delivered to the Contractor to aid in proper installation of manufacturer's equipment.

7. Certified statement by the galvanizer at the time of shipment indicating the conformity to ASTM specifications for all outdoor equipment.

8. Samples of any or call equipment upon request - free of charge to the Owner.

1.6 SUBMITTALS AFTER INSTALLATION

A. At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is

given. Assistance from the vibration isolation equipment manufacturer may be required.

1. A complete tabulation showing for each vibration isolator:

   a. The actual static deflection measured at the project and

   b. The specified minimum static deflection.

2. A report certifying:

   a. That each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level and

   b. That each piece of isolated equipment or equipment component (ducts, pipes, conduit, etc.) is not short-circuited by any means and

   c. That the requirements of Section 2.00 are satisfied for all equipment.

1.7 SUBSTITUTIONS

A. Substitutions of equal equipment beyond the alternates listed will be permitted only with the written permission of the Architect. Accompany each request for acceptance of substitute equipment with manufacturer's certified data proving the equivalence of the proposed substitute in quality and performance. The Architect shall be the final judge of the validity of the data submitted.

PART 2 - PRODUCTS

2.1 MATERIALS, COMPONENT AND PARTS

A. General:

1. All materials, components and parts shall be new.

2. Vibration isolators, bases and seismic and thrust restraints shall be the products of an experienced and approved manufacturer. Insofar as possible, they shall be the product of a single manufacturer.

3. All metal parts of vibration isolators installed out of doors shall be hot-dip galvanized after fabrication. Galvanizing shall comply with ASTM A 123, A153, and A386 as applicable.

B. Springs: Springs shall be so selected and installed that the ratio of spring diameter to final compressed height shall be no less than 0.8 and no more than 1.2. Further, each spring shall have a minimum additional travel to solid equal to 50% of its actual deflection.

C. Neoprene Elements: All elastomeric mounts, pads, bushings, sleeves, grommets, washers,
etc., shall have a Shore-A hardness of 30 to 50 durometer after minimum aging of 20 days or corresponding oven-aging.

D. Bases: For equipment that is not constructed with a base structure compatible with vibration isolation mounts, a base frame shall be supplied with the isolators. A base frame shall also be supplied where an item or equipment and its drive motor require a common

rigid base.

E. Seismic Restraints: Seismic restraints shall resist a seismic acceleration in any direction in accordance with all relevant codes without damage or deformation to equipment, building or mounts. Restraints shall not short-circuit vibration isolators during normal operation. Generally, there shall be as many seismic restraints as there are vibration isolators on a piece of equipment. Restraints and isolators shall be located close together on equipment or frames.

2.2 APPROVED MANUFACTURERS FOR MAJORITY OF PRODUCTS

A. The listing of a manufacturer's products below does not certify that it fully complies with these specifications. All modifications of a listed product required to bring it into compliance with these specifications shall be indicated in submittals and made prior to job site delivery.

1.	Amber/Booth Company	AB
2.	Mason Industries Inc. Los Angeles, California	Mason
3.	Kinetics Noise Control Inc. Dublin, Ohio	Kinetics
4.	Korfund Dynamics Corporation Westburg, L.I., New York	Korfund

2.3 VIBRATION ISOLATION MOUNTS

A. Mount P1 - Single or Multiple Neoprene Pad(s) and Bearing Plate(s): Neoprene pad shall be ribbed or waffled, 5/16 to 1/2 inch thick, 40 durometer, with a minimum 1/16 inch thick steel bearing plate on top. Size pad and bearing plate to receive 60 psi load. Provide single or multiple pads and plates in series as specified, with 1/16-inch-thick steel shim between layers. Provide "NR-1 plate(s)" by A/B, "W + plate(s) or WM" by Mason, "NPD-1 plate(s) or NLD" by Kinetics or approved equal.

B. Mount P2 - 2 Single or Multiple Extra Thick Neoprene Pad(s) and Bearing Plate(s): Neoprene pad shall be waffled, 3/4 inch thick, 30 or 40 or 50 durometer, as scheduled, with a minimum 1/16-inch thick steel bearing plate on top. Pad areas shall be selected so no more than 15% and no less than 10% deflection occurs due to the supported load. Provide single or multiple pads and plates in series as specified with 1/16-inch-thick steel shim between layers. Provide "Super W + plate(s) or SWM" by Mason or approved equal.

C. Mount P3 - Neoprene Bushing/Washer for Bolt Holes: Bushings and washers shall be minimum 3/16" thick in all places and maximum 40 durometer. Provide steel washers to distribute bolt head loads to neoprene bushings and washers. Bushings and washers are available from MBIS Inc. of Bedford Heights, Ohio; LA Rubber Company, Los Angeles, California; or Mason Industries, Hauppauge, New York.

D. Mount B1 - Neoprene-In-Shear Base Mount: Neoprene isolators shall be double-deflection neoprene-in-shear type with steel-reinforced base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be supplied in the base and the top shall have a threaded fastener. Neoprene no harder than 50 durometer. Provide "RVD" by A/B, "ND" by Mason, and "RD" by Kinetics or approved equal.

E. Mount B1EQ - Neoprene Mount with Seismic Restraint: A neoprene isolator with

concentric steel elements separated by neoprene no harder than 50 durometer. Mount capable of acting in tension, compression or shear. Provide "BR" by Mason or approved equal.

F. Mount B2 - Unhoused Spring Base Mount: Springs shall be designed and installed so their ends are parallel before and after installation and during equipment operation. All mounts shall have equipment leveling bolts. Each isolator shall have a steel base plate with mounting bolt holes and a ribbed or waffled neoprene friction pad permanently adhered to the bottom. The pad shall be 5/16 to 1/2 inch thick, 40 durometer hardness, and sized for a load of 60 psi. Provide "SW" by A/B, "SLFH" by Mason, or "FDS-B" by Kinetics or approved equal.

G. Mount B2EQ - Stable Spring Base Mount with Seismic restraint Housing: Springs shall be designed and installed so their ends are parallel before and after installation and during equipment operation. All mounts shall have equipment leveling bolts. A restraint housing shall be provided around each spring and shall limit equipment motion in all directions without damaging the mount during either a seismic or wind loading disturbance. Such housing shall be designed and installed so as to easily permit careful inspection of the enclosed springs. Mount shall resist a seismic acceleration in any direction of at least 0.5 G or as required by the relevant codes. Restraint housing shall not short-circuit the vibration-isolation performance of the spring during normal operation. Each spring sub-assembly shall have a friction pad of ribbed or waffled neoprene permanently adhered to the bottom. The pad shall be 5/16 to 1/2 inch thick, 40 durometer hardness, and sized for a load of 60 psi. Mount shall be welded or bolted to the building structure with bolts designed to resist the results of seismic or wind loading forces on the mount including mount overturning. Provide "SLR or SSLFH" by Mason, "FLS or FYS" by Kinetics or approved equal.

H. Mount B3 - Unhoused Spring Base Mount with Vertical Travel Limit: Springs shall be designed and installed so their ends are parallel before and after installation and during equipment operation. All mounts shall have equipment leveling bolts. All mounts shall have vertical travel limits stops to control spring extension when weight is removed. The travel time steps shall be capable of serving as blocking during erection of the equipment. A minimum clearance of 1/4 inch shall be maintained around restraining bolts and between the limit stops and the spring so as not to interfere with the spring action. Each isolator assembly shall have a friction pad of ribbed or waffled neoprene permanently adhered to the bottom. The pad shall be 5/16 to 1/2 inch thick, 40 durometer hardness, and sized for a load of 60 psi. Provide "CT" by A/B, "SLR" by Mason, and "FLS" by Kinetics or approved equal.

I. Mount H1 - Neoprene-In-Shear Hanger Mount: Vibration isolation hangers shall consist of a double-deflection neoprene-in-shear element contained in a steel housing. It shall be formed with a projecting neck bushing for the hole in the hanger housing that will prevent metal-to-metal contact between the hanger rod and the housing. The diameter of the hole in the housing shall be sufficient to permit the hanger rod to swing through a 30^{o} arc before contacting the hanger housing. Neoprene shall be no harder than 50 durometer. Provide "BRD" by A/B, "HD" by Mason, and "RH" by Kinetics or approved equal.

J. Mount HS - Spring Hanger Mount: Vibration isolation hangers shall contain a laterally-stable steel spring set in a neoprene cup manufactured with a bushing to prevent short-circuiting of the hanger rod as it passes through the hanger housing. The cup shall contain a steel washer designed to properly distribute the spring load on the neoprene and prevent its crushing. Spring diameters and hanger housing lower hole sizes shall be large enough to permit the hanger rod to swing through a 30^{o} arc before contacting the housing.

Neoprene cup shall be minimum 1/4 inch thick and maximum 50 durometer. Provide "30" by Mason or approved equal.

K. Mount H3 - Precompressed Spring Hanger Mount: Vibration isolation hangers shall be the same as Mount H2 but shall be delivered precompressed to their planned installed deflection to keep pipes or equipment steady during installation. Hangers shall be designed with a slow release mechanism to free the spring after installation is complete and the spring is fully loaded. Great care shall be taken to see that all springs are free to oscillate 0.25". Deflection shall be clearly indicated by means of a scale. Provide "PC30" by Mason or approved equal.

L. Mount H4 - High-Deflection Spring Hanger Mount: Same as Mount H2 with addition at top of hanger housing of double deflection neoprene in shear element no harder than 50 durometer and with total deflection capability up to 5 inches. Provide "30N or 30N-400" by Mason or approved equal.

M. Mount H5 - High Deflection Precompressed Spring hanger Mount: Same as Mount H3 with addition at top of hanger housing of double deflection neoprene in-shear element no harder than 50 durometer and with total deflection capability up to 5 inches. Provide "PC30N or PC30N-400" by Mason or approved equal.

N. Mount G1 - Vibration Isolation Curb Mount: Vibration isolation shall be a prefabricated assembly consisting of an extruded aluminum frame and spring vibration isolation system. The aluminum frame shall be sufficiently rigid to support the equipment load without detrimental deflection. Spring isolators shall be selected and positioned along the two long sides of curb no closer than 7'apart to achieve the minimum static deflection called for in the schedule. The static deflection of each individual isolator shall differ from the other by no more than 10%. Galvanizing requirements shall apply to each spring used in the curbs. Provide "GMAB" by Mason, "ASR" by Kinetics or approved equal.

O. Mount C2 - High Deflection Vibration Isolation Curb Mount: Vibration isolation curbs shall be a prefabricated assembly consisting of a lower frame of steel tube topped by steel springs resting on neoprene pads in turn topped with an upper frame which provides continuous equipment support. Upper frame and spring connections to be adjustable and to include resilient snubbing to resist wind and seismic forces. Springs to be galvanized, accessible and stable. Springs shall be placed no less than 7'apart along the 2 long sides of the curb. The static deflection of any individual spring shall differ from the others by no more than 10%. It shall be possible to replace individual springs while the isolated equipment is operating normally without affecting its performance. Provide "RSC" by Mason or approved equal.

2.4 EQUIPMENT BASES

A. Base BS1 - No Frame Required for Floor Mounting: This base mounting method shall be used only with small pieces of equipment that have an integral casing or base frame that is adequately strong to be supported directly on vibration isolators without deforming the casing or frame or affecting equipment or isolator operation to any significant or noticeable extent. Place vibration isolators directly under equipment or connect steel height-saving brackets to the side of the equipment and place isolators under brackets. Equipment manufacturer shall approve such mounting.

B. Base BS2 - Steel Frame for Floor Mounting: Steel frames for floor-mounted equipment shall consist of structural steel sections sized, spaced, and connected to form a rigid base that will not twist, rack, deform, or deflect in any manner that will negatively affect the

equipment or isolation mounts. Frames shall be adequately sized to support basic equipment units and motors plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure. Frames may be rectangular or tee shaped in plan. The depth of steel frame base members shall be minimum one-tenth the longest dimension of the base. Frame bases shall include side-mounting height-saving brackets for attachment to vibration isolators. Provide "SFB" by A/B, "WF" by Mason, and "SFB" by Kinetics or approved equal.

C. Base BS3 - Inertia Base for Floor Mounting: Concrete inertia bases for floor-mounted equipment shall be formed of stone aggregate concrete (150 lb/cu. ft) and appropriate steel reinforcing cast between perimeter structural steel sections. Inertia bases shall be built to form a rigid bast that will not twist, rack, deform, deflect, or crack in any manner that would negatively affect the operator of the supported equipment or the vibration isolation mounts. Inertia bases shall be adequately sized to support basic equipment units and motors plus any associated pipe elbow supports, duct elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure. Bases may be rectangular or tee shaped in plan. Inertia base thickness shall be minimum one twelfth the longest dimension of the inertia base but not less than 8 inches. Inertia bases shall include side mounting height saving brackets for attachment of vibration isolators. The steel frame and reinforcement shall be supplied by the vibration isolator manufacturer. Concrete is provided and poured by the Contractor off site. Provide "Custom" by A/D, "K" by Mason, and "CIB" by Kinetics or approved equal.

D. Base BS4 - No Frame Required For Ceiling Suspension: This suspension mounting method shall be used only with small pieces of equipment that have an integral casing with brackets or base frame that is adequately strong to be supported directly from underneath or the lower sides without deforming the casing or frame or affecting equipment or isolator operation to any significant or noticeable extent. Place channels under equipment unit or connect steel brackets to the lower sides of the unit. Suspend channels or brackets from steel rods connected to vibration isolation hangers which are connected to a stiff, heavy part of the structure. Neither channels nor brackets shall exhibit any noticeable deflection or distortion. Also provide slightly slack steel cables for seismic restraint per relevant codes. Equipment manufacturer shall approve such mounting.

E. Base BS5 - Steel Frame for Getting Suspension: Steel base frame for ceiling suspended equipment shall consist of structural steel sections sized, spaced, and connected to form a rigid base that will not twist, rock, deform, or deflect in any manner that will negatively affect the operation of the supported equipment or vibration isolators. Frames shall be adequately sized to support basis equipment units and motors plus any associated ducts or pipes or electrical elements closely related and requiring resilient in order to prevent vibration transfer to the building. The depth of the steel frame base members shall be no less than one twentieth the longest dimension of the base. Equipment shall be rigidly attached to top of frames. Provide "Mason M" or approved equal.

2.5 SEISMIC RESTRAINTS

A. EQR1 - Floor-Mounted equipment on Isolation Mounts without Seismic Restraint Housings: Separate earthquake restraints shall be provided for all floor-mounted equipment on vibration isolation mounts that do not include seismic restraint housings. Provide a minimum of four all-directional earthquake restraints that are located as close to the vibration isolators as possible to facilitate attachment to both the equipment base and the structure. The restraints shall consist of interlocking steel members restrained by a shock-absorbent neoprene bushing. Bushing shall be a minimum of 1/4 inch thick. Restraints

shall be manufactured with an air gap between hard and resilient material of 3/16 to 1/4 inch. Snubbers shall be installed with factory-set clearances. Snubber end shall be removable to allow inspection of internal clearances. Snubber bushing shall be rotated during and after installation to insure no short circuits exist. Restraints shall comply with Section 2330 of the 1991 Uniform Building Code and shall resist a seismic acceleration in any direction of at least 0.5 G without damage to themselves, the building or the equipment. Provide "Z-1011 or Z-1225" by Mason or approved equal.

B. EQR2 - Ceiling - Suspended Equipment on Isolation Hangers, Roof-Mounted Equipment on Isolation Curbs or Vibration Isolated Pipes or Ducts: Provide slightly slack steel cables of appropriate sizes and lengths and with appropriate fittings and anchorages for all ceiling-suspended equipment supported by vibration isolators, for all roof-mounted equipment on isolation curbs and for vibration isolated pipes and ducts. Hanger rods shall be reinforced against upward vertical loads where applicable and the entire system shall be restrained against seismic loads with slightly slack steel cables. Cable systems shall be designed to comply with Section 2330 of the 1991 Uniform Building Code and shall resist a seismic acceleration in any direction of at least 0.5 G without damage to themselves, the building or the equipment. Use seismic restraint cables as engineered and fabricated by A/B, Mason or approved equal.

2.6 THRUST RESTRAINTS

A. TR1 - Neoprene Type: Thrust restraint shall be custom fabricated using a Type B1 neoprene-in-shear isolator and a steel angle. Neoprene isolator bolted to one angle leg opposes equipment, thrust, and second angle leg bolted to appropriate structure. The steel angle shall be sufficiently rigid and the mounting sufficiently sized and secure to resist the lateral movement of equipment during on-off cycle.

B. TRS - Spring Type: Thrust restraint unit shall consist of a spring element in series with a neoprene cup. The unit shall be designed to have the same deflection as specified for the base mountings or hangers supporting the equipment. The spring element shall be adjusted in the field to allow for a maximum of 1/4-inch movement during starting or stopping of the equipment. The assembly shall be furnished complete with rods and angle brackets for attachment to both the equipment and the adjacent fixed structural anchor. Provide "WBI or WBD" by Mason or approved equal.

2.7 PIPING SPECIALTIES

A. FPC - Flexible Pipe Connectors: Flexible pipe connectors shall be fabricated of multiple plies of nylon cord, fabric, and neoprene, vulcanized so as to become inseparable and homogeneous. Straight connectors shall be formed into a double sphere shape. Elbow connectors shall have a single sphere shape at the curve of the unit. Flexible connectors shall be able to accept compressive, elongating, transverse, and angular movement. Flexible connectors shall be selected and specially outfitted if necessary to suit the system temperature, pressure, and fluid type. Connectors for pipe sizes 2 inches and smaller shall have threaded female union couplings on each end. Larger sizes shall be fitted with metallic flange couplings. Control cables shall be provided if required. Provide "MFTNC, MFNEC or MFTFU" by Mason or approved equal.

B. RPAG - Resilient Pipe Anchor or Guide: These units shall be the standard product of the vibration isolation mounting manufacturer, incorporating neoprene isolation elements that are specifically designed for providing resilient vertical and/or horizontal support when serving as a pipe anchor or guide. Minimum neoprene thickness 1/2 inch. Maximum neoprene durometer 50. Provide "Custom" by A/B, "ADA/GDA" by Mason, and "RSF" by

Kinetics or approved equal.

C. RPS1 - Resilient Pipe Sleeve at Support or Construction Penetration: This unit shall consist of a formed and stiffened galvanized steel sleeve lined on the inside with moisture and vermin resistant felt bonded to the metal sleeve and 1/2 inch thick. Sleeve inside diameter shall equal pipe outside diameter in each application. Sleeve shall be split longitudinally so it can be snapped over pipes and reclosed without damage. Sleeve lengths shall be as recommended by the manufacturer for the given diameters, but shall not be less than 3 inches. Provide "PR-Isolator" by Porter-Roemer, "Trisolator" by Stoneman Engineering or approved equal.

D. RPS2 - Resilient Pipe Sleeve at Construction Penetration: This unit shall consist of two bolted pipe halves with 3/4 inch or thicker neoprene sponge bonded to the inner faces. The seal shall be tightenable around the pipe to eliminate clearance between the inner sponge face and the piping. Sleeve shall be 2 inches longer than the thickness of the construction it penetrates. Where pipe temperatures exceed 240ºF, use 10-pcf-density glass fiber insulation in lieu of sponge neoprene. Provide "SWS" by Mason, "PS-1-D" by Kinetics or approved equal.

2.8 FLEXIBLE DUCT CONNECTIONS

A. Fabricate flexible sleeves for connecting ducts to fans of neoprene-impregnated fabric or loaded vinyl, as scheduled. Sleeve material shall be impervious to air. Loaded vinyl shall weigh minimum 1 pound per square foot and shall be "KNC-100B" by Kinetics or equal.

2.9 FLEXIBLE ELECTRICAL CONNECTIONS

A. Make flexible electrical connections to all vibrating equipment so as to prevent any vibration transfer to the building.

1. Alternate A: Enjoy flexible electrical conduit installed grossly slack.

2. Alternate B: Employ flexible expansion/deflection conduit couplings sized for the application (1-to 6- inch diameters available). Coupling to have flexible and watertight outer jacket, inner grounding strap, flexible plastic inner sleeve to maintain smooth wire way, and end hubs with threads to fit standard threaded metal conduit. Coupling shall be "XD Xpansion/Deflection Coupling" by Crouse-Hinds of Syracuse, New York, or "Type DF Expansion and Deflection Fitting" by Spring City Electrical Mfg. Co. of Spring City, Pennsylvania,

2.10 CUSTOM RESILIENT AND AIRTIGHT SLEEVE FOR DUCTS OR PIPES AT CONSTRUCTION PENETRATIONS

A. Sleeve shall be custom-fabricated. It shall be formed from pipe or sheet metal that is 1 inch larger in each cross-sectional dimension than the penetrating element and is 2 inches longer than the thickness of the construction penetrated. The annular space between the sleeve and the penetrating element shall be packed tightly with long-fiber glass fiber of 2-to 3-pcf density to within 1/2 inch of the ends of the sleeve. The remaining 1/2-inch space at each end shall be filled completely with acoustical sealant to form an airtight seal. Glass fiber packing by CertainTeed, Manville, or Owens-Corning. Acoustical Sealant by DAP, Tremco or U.S. Gypsum, choice depending on application and as approved by Architect.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS PRIOR TO INSTALLATION

A. Prior to installation of vibration isolators, frames, guides, seismic restraints and related materials, the following conditions shall be met:

1. All submittals for equipment shall be approved by the Architect.

2. Written and oral instructions from the vibration isolation equipment Manufacturer shall be obtained.

3. Any conflicts between trades resulting in unavoidable rigid contact of vibrating equipment piping or ductwork due to inadequate space or other unforeseen conditions shall be brought to the Architect's attention. If these conflicts are not resolved before installation, all corrective work shall be at the Contractor's expense.

4. Any discrepancies between the specifications and field conditions or any changes due to specific equipment selection shall be brought to the Architect's attention. If these discrepancies are not resolved before installation, all corrective work shall be at the Contractor's expense.

3.2 GENERAL REQUIREMENTS FOR INSTALLATION

A. Furnish and install vibration isolators, bases, seismic restraints and related materials and insure the following:

1. No mechanical equipment or piping shall make rigid contact with the "building" unless it is approved in this specification or by the Architect. "Building" includes, but is not limited to: roofs, floors, beams, columns, walls, partitions, ceilings, studs, ceiling framing and suspension systems. Space all vibration-isolated equipment and isolated components and all vibration isolators (including rods and wires) so as to be entirely free of any contact with any building element in any reasonable operating position.

2. The installation or use of vibration isolators shall not cause any change of position of equipment or piping or ducts that results in stresses in any connections or misalignment of shafts or bearings. In order to meet this objective, equipment, piping, and ducts shall be maintained in a rigid position during installation. The load shall not be transferred to the isolators until the installation is complete and in operational condition.

3. No equipment unit shall bear directly on or be suspended from vibration isolators or brackets unless its own frame or casing is suitably rigid to span between isolators without any significant or noticeable deformation and such support is approved by the manufacturer.

4. All rigidly-or resiliently-installed equipment, piping and ducts shall be capable of resisting seismic input from the building in any direction without damaging the building, equipment or mounting system.

3.3 FLOOR OR ROOFTOP MOUNTED EQUIPMENT

A. Provide vibration isolation and seismic restraint for base-mounted equipment as scheduled and per all instructions in this specification.

B. Unless otherwise shown or specified, all base-mounted equipment shall be set on 4-inch thick, hard rock concrete housekeeping pads, vibration isolators and seismic restraints shall be bolted to the housekeeping pad. The pad dimensions shall exceed the equipment footprint (including floor mounts) by at least 12" in each direction (i.e. 6" per side).

C. Unless otherwise indicated, a minimum clearance of 1 inch shall be provided between the top of a housekeeping pad or floor or roof and the underside of an equipment unit or steel base frame that is vibration-isolated. The minimum clearance where a concrete inertia block is used shall be 2" or 3% of the base's smaller dimension, whichever is larger. This space shall be cleaned thoroughly of all dirt and debris.

D. For isolation equipment (Mounts B2 and B3) with neoprene pads bearing directly on structure, fasten the isolator base plates to the building structure with suitable bolts. Isolate steel bolts from steel base plates with neoprene bushings or washers and sleeves (Mount Type P3). Size bolt holes in isolator bases to account for neoprene bushings or sleeves.

E. All bases for pumps shall be of sufficient area to support and required pipe stanchions below pipe elbows.

F. Bases for boilers shall be of sufficient area to support draft fans, if included.

G. Fans and pumps and their respective motors shall always be mounted on a common base.

H. Cooling towers and fluid coolers shall be resiliently isolated from the structure by means of vibration isolators provided between suitably-framed grillage and dunnage steel or building structure. Approved seismic restraints shall be provided between the grillage and dunnage steel or structure. The isolators shall serve as blocking during the erection of the towers and after the tower basins have been filled with water. The isolators shall be adjusted to carry the tower and water load resiliently after the tower has been filled. Seismic restraints shall be installed and adjusted after isolators have been adjusted. Chillers shall be treated similarly.

I. Wind loads shall be accounted for in rooftop installations, including appropriate snubbers and slack-cable restraints.

J. Vibration isolation curbs shall be made weathertight by sealing with flexible aluminum flashing or closed-cell neoprene or flexible vinyl all around the periphery. This weatherproofing shall in no way inhibit the vibration isolation of the spring elements. A closed-cell sponge gasket shall be provided between the equipment unit and the curb to form a weathertight seal.

3.4 CEILING OR ROOF SUSPENDED EQUIPMENT

A. Provide vibration isolation and seismic restraint for suspended equipment as scheduled and per all instructions within this specification.

B. Ceiling or roof suspended equipment shall be supported from the heaviest possible structure, such as trusses, girders, beams, or joists. If necessary, provide heavy extra sub-structure between the building's existing heavy structures in order to support vibration-isolated equipment. Do not suspend equipment from roof decks or floors without approval of the Architect. Connect vibration isolation hangers directly to, or as close as possible to, heavy structure.

C. Hanger rods shall be aligned and free of contact with hanger boxes.

D. Fans and their respective motors shall always be suspended on a common, stiff frame.

3.5 SEISMIC RESTRAINTS

A. Size, select, and install all seismic restraints so as to resist seismic forces from the building in any direction without damaged to equipment, isolators, restraints, or building. Restraints shall not short-circuit vibration isolators during normal operation. Restraints shall comply with Section 2330, Earthquake Design, of the 1991 Uniform Building Code and any local codes and shall resist an acceleration of at least 0.5 G.

B. One seismic restraint shall be provided for each vibration isolator supporting floor-or rooftop mounted equipment, pipes or ducts.

C. Seismic restraint cables shall be provided for all vibration isolated ceiling or roof-suspended equipment, pipes or ducts. Adjust cables with care to handle required forces but not short-circuit isolation.

D. Hanger rods supporting ceiling or roof-suspended equipment shall be reinforced by cross-bracing or sleeves to resist lateral and upward vertical seismic loading.

E. All vibration isolators, seismic restraints, springs with seismic restraint housings, and seismic restraint cables shall be suitably secured to appropriate structure so that the fastenings and structure can handle the seismic load.

3.6 THRUST RESTRAINTS

A. Provide horizontal thrust restraints as scheduled for fans delivering large air quantities and with a tendency to rock back on their spring mounts. Install thrust restraints parallel to the axis of air delivery and in pairs on opposite sides of the fan.

3.7 RESILIENT SUPPORT OF DUCTS

A. Provide resilient support of ducts in locations and on isolators as scheduled and/or as shown on the drawings. Provide seismic restraints for ducts and their suspension systems.

3.8 RESILIENT SUPPORT OF PIPES

A. Unless otherwise specified, provide resilient support for all HVAC and plumbing water pipes throughout the building. No such piping is to come into rigid contact with the building.

B. Where "piping systems" are required to be vibration-isolated in a certain room or for a certain distance from an equipment unit, "piping systems" shall include all pipes, valves, strainers, tanks, converters, and other connected hardware.

C. Support all piping in mechanical equipment rooms on Type B3 or B4 or H3 springs sized for minimum 1-inch static deflection, unless otherwise noted.

D. Support on vibration isolators all piping outside of mechanical equipment rooms which is connected to and within 30 foot radius of a vibration isolated piece of equipment. If the piece of equipment is supposed on neoprene isolators, support pipes on Type B1 or H1 isolators sized for minimum 0.35-inch deflection. If the piece of equipment is supported on spring isolators, support pipes on Type B3 or B4 or H3 springs sized for minimum 1-inch deflection.

E. Throughout the rest of the building not covered in B or C above, use RPS1 resilient pipe sleeves for support. An alternate to this 1-inch-thick, 10-pcf-density glass fiber pipe insulation with suitable bearing plates to prevent crushing of insulation and without any steel pin or other rigid connection from plate to pipe through insulation.

F. Provide Type RPS1 or RPS2 or Customer resilient pipe sleeves wherever pipes penetrate construction.

G. Provide Type RPAG resilient pipe anchor/guide where anchors and/or guides are required in horizontal and vertical piping. Connect RPAG units to heavy structure only.

H. Release restraining washers and nuts in order to "free" all precompressed spring hangers.

3.09 PIPE CONNECTIONS TO EQUIPMENT

A. Piping connected to vibration-isolated equipment shall be installed so that it does not strain or force out of alignment vibration isolators supporting either the equipment or the piping. To facilitate such connection, any flexible connector approved by the Architect is acceptable.

B. Where specifically scheduled and located, provide Type FPC flexible pipe connectors.

3.10 DUCT CONNECTIONS TO EQUIPMENT

A. Provide flexible connections between ducts and all vibrating equipment. Use neoprene-impregnated fabric material unless loaded vinyl is specifically scheduled.

B. Align sheet metal duct with fan or fan casing opening in all three dimensions prior to installation of flexible connection so that duct and opening nearly coincide and are almost equally spaced 3 inches from one another all around. Do not install flexible connection until above requirements are met. Fans or fan casings and ducts shall be able to move 1 inch in any direction relative to each other without short-circuiting metal to metal or stretching taut the flexible connection.

3.11 ELECTRICAL CONNECTIONS TO EQUIPMENT

A. Make flexible electrical connections to all vibrating equipment.

1. Alternate A: Install flexible conduit in a grossly slack, shallow "U" form. Flexible conduit to be at least 3 feet or 20 diameters long, whichever is the longer.

2. Alternate B: The flexible coupling shall be free of any nearby building construction and shall be installed slack and free of strain in any direction.

3.12 RESILIENT AND AIRTIGHT SLEEVES

A. Customer Sleeves

1. Cut a clean opening in the penetrated construction very nearly the size of the sleeve for each penetrating element. Provide lintels above, relief structure below, and vertical framing between and to the sides as required. Provide the above, escutcheon plates, and anything else necessary to make the penetrated structure as solid and massive near the penetrations as away from the penetrations.

2. Set the metal sleeve into the penetrated construction in an airtight manner around its outer periphery, using grout, dry packing, plaster, or drywall compound full depth and all around-but only to a maximum width of 1 inch-or the requirements of the above paragraph shall not have been satisfied.

3. Pack the 1/2-inch wide annular opening with glass fiber between metal sleeve and penetrating element full depth all around to a firm degree of compaction. Leave a 1/2-inch deep annular opening free at each end of the metal sleeve; fill this fully with acoustical sealant.

B. RPS1 and PPS2 Resilient Pipe Sleeves: Observe requirements in 3.10A1 and 2 above. In lieu of packing and sealant, clamp factory-fabricated sleeve assemblies tightly around penetrating elements, using built-in or field-supplied clamping devices. Apply clamping of sleeves to penetrating services before sealing of sleeves to penetrated constructions.

END OF SECTION

SECTION 15300A

FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section provides for automatic sprinkler system and portable fire extinguishers.

B. The work also includes performing fire flow tests at the site to obtain data for final sprinkler system hydraulic calculations

C. Provide fire protection system with drain valves, inspectors test valves and sway braces. There shall be enough drain valves at strategic locations to enable draining all the water from the systems.

D. Provide fire protection during construction.

1.2 QUALITY ASSURANCE

A. Installation of automatic sprinkler system shall be in accordance 2009 International Building Code, 2009 International Fire Code and NFPA 13.

B. Installation of Portable Fire Extinguisher shall be in accordance of 2009 International Building Code.

C. All equipment and system components shall bear UL or FM label or marking.

D. Specialist Firm: A company specializing in the installation of sprinklers and other fire protection systems with at least five (5) years experience, such as Grinnnell Fire Protection System Company or Pacific Fire Protection, Inc.

E. Installation of the Automatic Sprinkler System shall be done by a Specialist Firm. If experienced in the installation of sprinklers and other fire protection systems for at least (5) years the Mechanical Contractor may install the fire protection systems under the supervision of the Specialist Firm.

1.3 SUBMITTALS

A. General: Comply with the provisions of Section 15000.

B. Installation Shop Drawings:

1. Within 35 calendar days after award of Contract, submit sprinkler head layout, coordinated with reflected ceiling plans.

2. Within 30 calendar days after approval of sprinkler head layout, submit sprinkler and other fire protection system layout. Include hydraulic calculations based on installation shop drawings layout and hydraulic data obtained from the fire flow test.

3. All installation shop drawings and hydraulic calculations shall bear the stamps of a Registered Fire Protection Engineer and a Mechanical Engineer currently

registered in Guam.

C. Product Data: Within 35 calendar days after award of Contract, submit

1. Catalog cuts and other data required to demonstrate compliance with the specified requirements for the following:

a. Sprinkler Heads
b. Flexible Pipe

PART 2 - MATERIALS

2.1 PIPING

A. Underground piping shall be Class 150 cast iron pipe conforming to ANSI 21.51 (AWWA C151). Fitting shall be cast iron conforming to ANSI A21.10 (AWWA C110), mechanical coupling.

B. Aboveground sprinkler piping shall be Schedule 40 black steel pipe with black cast iron screwed fittings for pipe sizes up to 2". Pipes bigger than 2" shall be roll-grooved black steel pipes and fittings, Schedule 10 for pipe sizes up to 5", 0.134" for 6" pipes and 0.188 for 8" to 10" pipes.

C. Aboveground sprinkler piping shall be Schedule 40 galvanized steel pipes, ASTM A120 with 300 lbs. galvanized malleable iron screwed fittings, ANSI B16.3.

D. All piping shall be rated for a minimum of 175 psig working pressure. Maximum system pressure shall not exceed 300 psig.

2.2 SPRINKLER HEADS

A. ½" N.P.T. pipe connection ½" nominal orifice size, intermediate .degree rating, "Grinnell" Duraspeed Sprinkler with SSP-1 or SSP-3 deflector or approved equal. At areas with ceiling, sprinkler heads shall be pendant type, chrome finish with Figure 410 chrome ceiling plate. At areas without ceiling, sprinkler heads shall be upright, plain brass, with Model F774 sprinkler guard finish painted to match brass color of sprinkler head.

PART 3 - EXECUTION

3.1 PIPING

A. Place pipe runs to minimize obstructions to other work.

B. Place piping in concealed spaces above finished ceilings.

3.2 ACCEPTANCE REQUIREMENTS

A. Perform all acceptance requirements in accordance with the referenced standards.

B. Flushing of Piping: Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to the sprinkler piping. Before connecting sprinkler system to the water main, the sprinkler system shall be sterilized. Sterilization shall be in accordance with Interior Plumbing System, Section 15400.

C. Hydrostatic Test: All interior piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psig and shall maintain that pressure without loss for two (2) hours.

D. Dry System Air Test: An air pressure leakage test at 40 psig shall be conducted fore 24 hours. Correct all leakage that will result in a pressure loss in excess of 1-1/2 psi.

E. System Operational Tests: Contractor shall request the Fire Department to witness all system operational test.

F. Complete, sign, and submit all required Contractor's Material and Test Certificates.

G. Provide all literature and instructions provided by the manufacturers describing proper operation and maintenance of any equipment and devices installed. Provide three (3) publications titled NFPA 13A, Recommended Practice for Inspection, Testing and Maintenance of Sprinkler System.

--END OF SECTION--

SECTION 15500

AIR CONDITIONING AND VENTILATION SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work Included: Air conditioning and ventilation required for this Work is indicated on the Drawings and includes, but is not necessarily limited to:

1. Air conditioning and ventilation equipment.

2. Ductwork and accessories.

3. Diffusers, Grilles, and Registers.

4. Chilled Water Piping and Accessories.

5. Condensate Drain Piping.

6. Insulation.

7. Controls.

8. All other items required for a complete and operating air conditioning and ventilation systems.

B. Related Work Described Elsewhere: Power wiring, Section 16400.

1.2 QUALITY ASSURANCE

A. Qualifications of Installers

1. For the actual fabrication, installation, and testing of work under this Section, uses only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.

2. In acceptance or rejection of installed work, the Architect will make no allowance for lack of skill on the part of workmen.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in the Standards listed below, latest edition, as published by the Sheet Metal and Air Conditioning Contractor's National Association.

1. HVAC Duct Construction Standards, Metal and Flexible.

2. Fiberglass Duct Construction Standard.

3. Duct Liner Application Standard.

4. HVAC Systems Testing, Adjusting, and Balancing.

1.3 SUBMITTALS

A. General: Comply with the provisions of Section 15000.

B. Product Data: Within 35 calendar days after award of the Contract, submit:

1. Following items proposed to be furnished and installed under this section.

a. All air conditioning and ventilating equipment

b. Diffusers, Grilles and Registers

c. Insulation

2. Shop Drawing showing all details of the proposed installation, and the interface of ducts, piping and equipment with all other items.

3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

C. Record Documents: During progress of the Work, maintain an accurate record of all changes made in the air conditioning and ventilating systems from the layout and materials shown on the approved submittals.

D. Manual: Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Owner and the Architect each three copies of the operations and maintenance Manual. Include in each copy of the Manual a copy of the Record Documents.

E. Control Wiring Diagrams: Submit for approval along with shop drawings.

1.4 PRODUCTS HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General: All equipment shall be the capacity and types shown on the Equipment Schedule in the Drawings, and shall be the listed manufacturer and model number or shall be an equal approved in advance by the Architect. Use only air conditioning equipment that has local representatives.

B. Single Source: For ease of maintenance and parts replacement, to the maximum extent possible use equipment of a single manufacturer.

C. The Architect reserves the right to reject any materials list which contains equipment from various manufacturers if suitable materials can be secured from fewer manufacturers, and

to require source of materials to be unified to the maximum extent possible.

D. Fan - Coil Units: (Chilled Water)

1. Fan Coil Units shall be factory fabricated consisting of a water coil, blower and motor, condensate drain pan, double wall with 1" thick throwaway filter, and 18 gauge galvanized steel casing with at least 1/2" thick fiberglass insulation. Coils shall be of copper tubes with aluminum fins. Motor shall have overload protection. Drain pan shall be doubly insulated galvanized steel, pitched for positive drainage and extensive enough to catch condensate from control valves.

2. Each Fan-Coil unit shall be provided complete with valve package and wiring package. Valve package shall include two compression stop valve, one balancing valve, and one two-way, two position motorized control valve. Wiring package shall include 3-speed fan switch and thermostat on a decorative wall plate.

3. Fan-Coil Units to be installed above the ceiling shall be "Carrier" Model 42DH model or approved equal.

E. Air Handling Units (Carrier 39M Series)

1. Unit shall be factory built and factory tested, with performances based on tests conducted in accordance with AMCA Standard 210 and ARI Standard 410.

2. Unit shall consist of fan section, pre-cool and main coil section; filter section, condensate drain pan and mixing box.

3. Casing shall be of 20 gauge minimum mil-galvanized steel, reinforced with structural sections properly designed to withstand specific operating pressures, with properly reinforced points for hanging of units as may be necessary. All panels shall be easily removable for access to internal parts, gasketed to ensure a tight seal. Access doors shall be provided for inspection. Access doors shall be hinged, double-wall, with 1.5 dual-density fiberglass insulation between galvanized steel panel. Casing and frame shall be covered with protective finish on both sides, with fiberglass insulation from the air entrance at the coils to the air outlet from the unit. Insulation shall be securely attached to casing with waterproof adhesive of sufficient thickness and density to prevent condensation from forming on the unit, and protected against deterioration from air currents.

4. Fan section shall include fan assemblies with adjustable V-belt drives, adjustable motor base, and belt guard with opening for tachometer. Fans shall be centrifugal, with forward-curved blades, double inlet; bonderized steel painted with baked enamel or galvanized steel. Fan shaft shall not pass through its first critical speed when unit comes up to rated rpm. Fan assemblies shall be statically and dynamically balanced in the fan housing after assembly. Bearings shall be of self-aligning grease lubricated type with accessible fittings for lubrication, selected for an average life of 200,000 hours of design operating conditions per ANSI Code B3.15.

5. Cooling coil shall be copper tube with aluminum fins. Coils shall be removable, pitched for proper drainage, and complete with baffle to assure no bypass air around coils.

6. Filter section shall have 2" thick throwaway type filters arranged in horizontal V

formation. Filters accessible from both sides through hinged access doors.

7. Condensate drain pan shall be installed under the cooling coil section and shall be extensive enough to catch condensate leaving the coil at the highest catalogued face velocity. The drain pan shall be of stainless steel, double wall construction, properly insulated to prevent condensation on the exterior part of the unit, complete with drain connections at low points in the drain pan.

8. Motor shall be of the premium efficiency, squirrel cage, induction type, NEMA Design B, with drip-proof enclosure, Class A insulation for 40^{o}C temperature rise, ball or roller grease lubricated, relubrication type bearings, and windings suitable for starters as specified below and power supply as indicated. Minimum service factor shall be 1.15; maximum motor speed shall be 1750 rpm.

9. Motor starter shall be NEMA Design B. Starter may be of the full voltage type provided that the motor starting current do not exceed values allowed by the local power company or other regulating agencies. Otherwise, starters shall be of the reduced current inrush star-delta type. All starters shall have bimetallic type overcurrent protective relays on each leg, 120-volt control circuits with integral transformers, auxiliary contact as required. Starter enclosures shall be NEMA 1.

10. Belt drive shall have V-belts with adjustable pitch fan pulleys. After balancing, replace adjustable pulleys with fixed pitch pulley. Each drive for motors larger than 1 horsepower shall have multiple belts. Pulleys shall be of cast iron, of the proper bore to fit shafts and shall be secured to shafts with keys and set screws. Variable pitch pulleys shall be sized so that required rpm will be obtained when the pulleys are set at mid-position of the pulley rpm range. Rating of each drive shall be at least 120% of the driving motor nameplate horsepower.

11. Air handling unit shall be product of "Carrier", 39M Series, or approved equivalent units as manufactured by "Trane", "York".

12. Unit shall have field-installed variable frequency drive for static pressure control.

13. Direct Digital Control

    a. The Product Integrated Controls (PIC) shall use a solid-state microprocessor-based controller to manage each function of the Air Handling equipment to which it is connected using Direct Digital Control and specifically designed software. The PIC control box shall be remotely installed and connected to a junction box in the unit's fan section. Matching controls shall be factory installed and wired as an integral part of the unit. All application software performing the required control functions shall be factory-supplied with the PIC, pre-tested, and pre-configured.

    b. All factory control wiring shall be internal to the unit. Internal wiring shall consist of plenum-rated wire. The electrical components shall be listed under UL. The unit shall be in compliance with the NFPA 90A Standard.

    c. The PIC shall be capable of providing stand-alone operation. The PIC shall accept analog and digital signals from sensors, switches, relays, etc. and shall multiplex the various signals into digital format. All closed-loop Direct Digital Control shall utilize PIC-based software algorithms that shall be resident in the PIC memory. All standard control, PIC based algorithms

shall operate independently of an online host computer or any other networked controller.

d. The control system shall provide the capability to perform the following functions.

(1) Control of the chilled water valve to maintain supply-air temperature (SAT) (variable air volume [VAV] units) or room temperature (constant volume [CV] units) to an occupied or unoccupied set point.

Control installed variable-frequency to maintain static pressure set point.

Indoor air quality control during occupied times using a single gas. When a single sensor reaches the field-adjustable setting, it shall modulate outside air control of dampers to reduce sensor CO_2 levels.

(2) Nightly purge of stagnant indoor air for a configured duration prior to occupancy.

(3) Control of supply fan to cause adaptable start/morning warm-up of the system.

(4) Monitor the analog inputs for alarm exceedence. Alarms based on difference between fan state and fan commanded state.

(5) Provide alarms based on pressurization, evacuation, smoke purge, and fire shutdown input states being true.

(6) Allow manual and system override of selected output channels and internal values.

(7) Support a human interface for display, set point, and diagnostic information.

(8) Include a full electronic 365-day time clock with backup capability. Timeclock supports hour, minute, day of week, day, month, and year.

(9) Remote timed override and timed override messages from the Building Supervisor.

(10) Filter maintenance.

(11) Smoke evacuation.

(12) Smoke purge.

(4) Fire shutdown.

(5) Runtime and consumables on all analog and discrete points.

(6) Maintenance and service data.

e. The PIC shall include a power supply that utilizes single-phase 120 vac, 60 Hz.

f. The PIC shall include an on/off switch to shut off the power to the controller.

g. Surge protection shall be provided for the communication circuits.

h. Electronic Timeclock – The Controller shall include a 365-day timeclock with backup capability. Timeclock shall support hour, minute, day of week, day, month, and year.

i. Time Schedule – The Controller shall support up to 8 occupied/unoccupied periods and 18 operator-defined holidays. A holiday period shall be programmable up to 99 consecutive days. The periods shall have the capability of assigning any day of the week or holiday to any of the occupied/unoccupied periods.

j. Discrete and analog inputs shall be able to interact with PIC resident algorithms for local processing or to provide a value for updating or alarm annunciation at a Building Supervisor.

k. The operator shall be able to modify, add, or delete times and set points using a Local Interface Device or portable PC with Building Supervisor. Systems that cause the loss of time and set point configuration data when new options are added are not acceptable.

l. The PIC shall be capable of operating in either a stand-alone mode or as part of a network with Building Supervisor and other PICs and FIDs (field-installed devices). The PIC shall be factory-configured for stand-alone operation. However, it shall be capable of local configuration via a Local Interface Device and remote configuration via a Building Supervisor. The operator shall be capable of making changes to PIC configurations as required to meet local operation conditions from either type of device.

m. Analog inputs shall be monitored in order to provide feedback to a control loop, to annunciate that an analog alarm limit has been exceeded, to offer centralized analog monitoring, and/or monitor consumable data.

n. Each analog output shall be capable of individual configuration via the Local Interface Device, portable PIC, and the Building Supervisor.

o. Diagnostics – The Controller shall have an onboard diagnostic program which can be activated whenever the unit is stopped. The program shall check all inputs and outputs for failures. As a minimum, the following equipment must be included in the diagnostic program:

p. Inputs

(1) Thermistors
(2) Fan status switch
(3) Mixed-air temperature sensor
(4) Static pressure transducer

(5) Relative humidity sensor
(6) Carbon dioxide sensor

q. Outputs

(1) Fan commanded state
(2) Cooling coil valve

r. Alarm Processing – The PIC shall contain a routine to process alarms. Alarm processing shall consist of a scan of all input points. The status of a digital input shall be able to be compared to a discrete output or to be independently monitored for alarm logic purposes. An analog input shall be capable of comparison to configurable, occupied/unoccupied, high and low limits, initiating an alarm when the limits are exceeded. Alarm processing logic shall also monitor return to normal conditions as part of the alarm scan.

The Controller shall be capable of providing local alarm indication for out-of-limit conditions, status, and thermistor or sensor failure. All alarms shall be displayed at the Local Interface Device and via the network to a remote Building Supervisor.

F. In-line Centrifugal Fans

1. Units shall be factory-assembled in-line fan, AMCA rated, with capacities as indicated. Each unit shall consist of a housing, fan and motor. Unit shall be selected to operate at the lower half of its capacity range.

2. Housing shall be square, of steel construction, with baked enamel finish internally lined with acoustical insulation, with diagonal bracings and hanging brackets with spring isolators. Fan shall be centrifugal, backward-curved, with spun venturi throat overlapped by the fan. Motor shall be isolated from the air stream by a motor enclosure and shall draw cooling air from outside the fan housing. Motor and fan assembly shall be mounted on a hinged side of the housing allowing the assembly to swing out for inspection, cleaning or service.

3. Units shall be "Greenheck" CSP Series or approved equal.

2.2 CHILLED AND CONDENSER WATER PIPING AND ACCESSORIES

A. Chilled Water Piping underground shall be pre-insulated copper piping. Insulation shall be closed cell foam-plastic insulation with asbestos cement pipe or polyvinyl chloride pipe casing. Fittings shall be compatible fittings as manufactured by pre-insulated pipe manufacturer.

B. Chilled and Condenser Water Piping aboveground shall be Schedule 40 black steel pipes, conforming to ASTM A-120 or A-53 with wrought steel butt-welding fittings, ANSI B16.9 for pipes 2-1/2" and larger and 125-lb. cast iron screwed fittings, ANSI B16.4 for pipes 2" and smaller. Welding neck flanges for pipes 2-1/2" and larger shall be forged steel, 150-lb., ANSI B16.5, flat or raised faced to match flanges on valves and equipment. Unions for pipes 2" and smaller shall be black malleable iron, ground joint, brass seat, 150-lb., ANSI B2.1.

C. Gate valves, 2" and smaller, on screw jointed piping, shall be bronze, with union bonnet,

inside screw, traveling stem, solid wedge, screwed ends, 200 lbs. W.O.G.

D. Gate valves bigger than 2", shall have iron body with bronze trim, solid wedge, outside screw and yoke, rising stem, flanged ends, 200 lbs. W.O.G.

E. Butterfly valves, at Contractor's option may be used in lieu of gate valves 3" and bigger. Valves shall have ductile iron, or steel bodies, with aluminum bronze, cadmium plated ductile iron, or stainless steel discs, Buna "N" rubber seats, stainless steel shafts, and 2" neck extensions. Valves shall be flanged or tapped, 200 lbs. W.O.G. Valves shall have lever operators with position indicators.

F. Plug Valves shall have semi-steel bodies with bronze eccentric plugs, bronze bearings, and compressible resilient molded seals. Valves 3" and smaller shall have screwed ends and lever operators with memory stops. Valves bigger than 3" shall have flanged ends and worm gear actuated handwheels. All valves shall be rated for 200 lbs. W.O.G.

G. Calibrated Balance Valve

1. Valves designed to preset balance point for proportional system balance prior to system start-up.

2. Valves shall have bronze body, brass ball with glass and carbon filled TFE seat rings.

3. Valves to have differential pressure and read-out ports across valve seat area. Read-out ports to be fitted with internal EPT inserts and check valves.

4. Valves bodies to have ¼" NPT tapped drain/purge port.

5. Valves shall have memory stop feature and calibrated nameplates and shall be designed for positive shut-off.

6. Working pressure shall be 200 psig minimum.

7. Bell and Gossett Circuit Setter Plus or approved equal.

H. Piping Accessories

1. Thermometers: Thermometers shall be of the liquid filled, universal angle type dial thermometer with brass thermometer wells, 4-1/2" diameter, white faced dial, aluminum case, and brass stems. Thermometer range shall be 0 to 100 degrees F. Thermometers shall be "Trerice" No. L80742 or approved equal as manufactured by "Marsh", "Marshalltown" or "U.S. Gage".

2. Pressure Gage: Gages shall be of the bourdon spring type with 4-1/2" diameter, white dial face, aluminum case, gage cocks and snubbers, 30" Hg. vacuum to 60 psig scale range at pump suction, 0 to 100 psig scale range elsewhere. "Trerice" No. 500X, or approved equal as manufactured by "Marsh", "Marshalltown" or "U.S. Gage".

3. Strainers: Strainers shall be rated for 200 psig W.O.G., of the wye pattern type, with cast iron body, heavy gage perforated brass strainer with 1/8" perforations, blow-off connections provided with 1" blow off valves, bolted cover flange, and flanged connections. Strainer connections shall be of the same size as the line

where the strainer is located.

4. Flexible Pipe Connections on chilled water lines shall be of the two arch bellows type, complete with molded teflon bellows, reinforcing rings, ductile flanges, limit bolts, and gaskets, as manufactured by "Resistofle" or approved equivalent as manufactured by "Vibration Mounting & Controls" or "Belmont Packing & Rubber Co.".

2.3 CONDENSATE DRAIN PIPING

A. Condensate drain piping shall be polyvinyl chloride DWV pipes and fittings conforming to ASTM D2665 with solvent weld joints inside the building, schedule 40 galvanized steel pipes conforming to ASTM A53 or A120 with screwed cast iron drainage fittings when exposed outdoors.

2.4 DUCTWORK

A. Air conditioning and ventilation ducts, other than hood exhaust ducts shall be fabricated from prime grade galvanized steel sheets.

B. Kitchen hood exhaust duct shall be 18 gauge stainless steel where exposed, 16 gauge black steel where concealed.

C. High velocity flexible round ducts shall be vinyl coated spring steel wire helix, tightly woven fiberglass impregnated and vinyl coated inner liner, 1-1/4" thick fiber glass insulation, and metalized Mylar/neoprene laminate fiberglass scrim reinforced outer jacket. High velocity flexible round ducts shall be UL listed as Class I duct, "Thermaflex" Type M-KH or approved equal as manufactured by "Wiremold". All flexible ducts from high velocity ducts to variable air control boxes and air terminals are high velocity flexible ducts.

2.5 DUCTWORK ACCESSORIES

A. Volume dampers shall be factory fabricated of galvanized steel, at least 2 gauges heavier than duct where dampers are installed, single-bladed for duct depths up to 10", opposed blade type for ducts with depths more than 10" complete with indicating locking quadrants. Volume dampers for installation above plaster ceilings shall have remote damper operators mounted on plaster ceilings.

B. Round fire dampers shall be U.L. listed, with 16 gauge steel frame, steel curtain, curtain stay and 160 degrees F. fusible link, "Tuttle and Bailey" Model F or approved equal as manufactured by "Air Balance", "Prefco", "Phillips-Aire", or "American Warming and Ventilating, Inc.".

C. Rectangular fire dampers shall be U.L. listed with 18 gauge steel frame, steel curtain, 160 degrees F., fusible link and positive lock in closed position. Steel frame shall have baked enamel finish. Fire dampers shall be "Tuttle and Bailey" Models F1 and F2 or approved equal as manufactured by "Air Balance", "Prefco", or "Phillips-Aire", or "American Warming and Ventilating, Inc.".

D. Smoke dampers shall be combination smoke-fire damper, similar in construction to rectangular fire dampers specified above but with side wall spring loaded side seals and electrically activated smoke link in series with the fusible fire link. Smoke damper shall be "Tuttle and Bailey" Model SF1 or SF2 or approved equal as manufactured by "Air Balance", "Prefco", or "Phillips-Aire", or "American Warming and Ventilating, Inc.". Smoke dampers

shall be provided complete with duct mounted smoke detectors and transformer to operate smoke dampers.

E. Air extractors shall be factory fabricated of galvanized steel with a series of radius vanes attached to a pivoting frame and bracket, gang-operated with all vanes synchronized to move as unit. Adjustable in any position from open (45 degree) to closed through a rotary operator accessible from the outside of duct.

F. Turning vanes shall be factory fabricated of galvanized steel, with double-walled blades rolled from a single sheet of metal, assembled over precision-formed tenons on the side pieces. Turning vanes shall be screwed or riveted into the duct elbow.

G. Sound Attenuators:

1. Sound attenuators shall be factory-fabricated of 22 gauge galvanized steel outer casing, 26 gauge galvanized steel interior partitions, and inorganic glass fiber filler material.

2. Filler material shall be of proper density to obtain specified acoustic performance and be packed under not less than 5% compression to eliminate voids due to vibration and settling and shall be encapsulated and sealed with mylar or tedlar film approximately 1.5 mils thick. The encapsulated fill material shall be separated from the interior perforated baffles by a non-combustible, erosion-resistant, acoustic stand-off.

3. Flame spread and smoke developed rating of acoustic fill, encapsulation film, and acoustic stand-off shall not exceed 20 each.

1. Units shall be constructed in accordance with ASHRAE Guide recommendations for high pressure ductwork and shall not fail structurally when subjected to a differential pressure of 8 inches water gauge from inside to outside casing.

2. Acoustic and Aerodynamic Performance shall be as follows:

Face Velocity FPD	Self Noise PWL (dB)	DYNAMIC INSERTION LOSS dB @ 250 Hz				Pressure Drop, "W.G."	
		SOUND ATTENUATOR LENGTH- FT					
		3	5	7	10	3	10
500	45	23	32	41	48	0.14	0.18

H. Duct silencers shall be "Korfund" Model 36 LP or approved equal as manufactured by "Anemostat", "IAC" or "Koppers".

2.6 AIR INLETS AND OUTLETS

A. The following items are products of "Tuttle and Bailey" (Hart & Cooley), similar and equal units as manufactured by "Carnes", "J and J", or "Waterloo" are acceptable. All air outlets shall be factory-finish painted to match adjacent surface color. Contractor shall submit manufacturers color chart for color selection by the Architect.

1. Light diffusers shall be Type TD single or dual side diffusers as indicated,

coordinated to fit the air handling light fixtures to be provided under another section, complete with separate adjustable pattern controllers in the diffuser discharge and volume dampers in the unit collar, both accessible through the light fixture slot. Diffusers shall be of hot dipped galvanized steel, painted flat black at the outlet, provided with insulation jacket.

2. Supply air registers shall be Series A-647 extruded aluminum registers with removable core, double deflection, vertical outer bars, A45 frame, opposed-blade dampers, and type VLR vectrol air extractors.

3. Return, outside air and exhaust registers shall be Series A110 aluminum registers with A45 frame, 1-1/4" margin, horizontal bars set at 40 degrees, and opposed blade volume dampers.

4. Return and transfer grilles shall be as specified for return registers except without volume dampers.

5. Square ceiling diffusers with square necks shall be Type AME aluminum construction ceiling diffusers with pattern control as shown, M-7 opposed blade damper, M-6 grid.

3. Square ceiling diffusers with round necks shall be Type AMASR, aluminum construction, baked white enamel finish, with opposed blade volume damper.

7. Half-round ceiling diffusers shall be Type PH, fixed pattern, flush face, aluminum construction with removable core, PH-7 damper, and PH-6 Grid.

8. Return grilles with filters shall be Series A110FB with bars set at 40 degrees, complete with 1" thick throwaway filters and filter retaining clips.

9. Linear return grilles shall be Imperialine Series 4000, extruded aluminum construction, with 30 degree core deflection, margin style A and No. 3 frame for tile ceiling installation.

10. Door grilles shall be Series A990VF extruded aluminum with V-shaped sight tight louvers at ½" on centers.

B. Round supply air registers shall be "Seiho" Model RHV Aluminum Round Register, double-deflection with vertical outer blades. Body shall be one piece aluminum with concealed mounting bracket. Provide each register with manual volume damper. Blade shall be airfoil extruded aluminum. Finish color shall match adjacent surface.

2.7 LOUVERED PENTHOUSE

A. Louvered penthouse shall have 16 gauge galvanized frames and corners, 20 gauges galvanized steel storm-proof blades, 16 gauge galvanized, and removable steel roof and galvanized angle framing.

B. Roof shall be insulated with 1" thick fiberglass with vapor barrier.

C. All intake openings shall be provided with PVC coated galvanized steel screen, 1/2" mesh.

D. Entire louvered penthouse shall be factory finish painted to match surrounding surface color. Color as approved by the Architect.

E. Louvered penthouse shall be Carnes Model P-440, with L-40 blades or approved equal.

2.8 OUTSIDE AIR INTAKE LOUVERS

A. Outside air intake louvers shall be all aluminum with PVC coated galvanized wire screen, 1/2" screen mesh.

B. Blades shall be "S" shaped, spaced at 2", installed at 20^{o}.

C. Duct collars shall be provided for outside air duct connection.

D. Outside air intake louvers shall be "Carnes" Model L-40 or approved equal.

2.9 INSULATION, ADHESIVES, TAPES, SEALERS

A. All insulation, adhesives, tapes and sealers shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with ASTM E84.

B. Duct Liners:

1. Duct liners shall be 1” thick non-fibrous flexible polyimide foam insulation. Airstream surface shall be coated with acrylic polymer coating and shall withstand 5,000 feet per minute air velocity.

2. K-Factor at 75^{0} F shall not exceed 0.35 Btu-in/hr-sf-^{0}F. Flame spread and smoke developed rating shall not exceed 25 and 50 respectively.

3. Liner shall be non-corrosive, fungi and bacteria resistant.

4. Sound absorption of 1” thick liner shall be as follows:

Frequency	Sound Absorption
125	0.18
250	0.29
500	0.52
1,000	0.93
2,000	0.86
4,000	0.85
NRC	0.65

5. Duct liner shall be “Johns Manville” polycoustic with permacote coating or approved equal as manufactured by “Owens-Corning” or “Banded Logic”.

C. External Air Conditioning Duct Insulation shall be 1-1/2" thick faced fiberglass duct wrap, Type FRK25, Series ED-100 as manufactured by "Owens-Corning" or approved equal as manufactured by "Johns-Manville" or "Certain Teed".

D. Chilled Water Piping and Refrigerant suction line insulation shall be 1-1/2" thick foamglass insulation, product of "Pittsburgh-Corning" or approved equal, with Pittwrap jacketing. All insulation outdoors shall have additional stainless steel jacketing.

E. Condensate drain insulation shall be as specified for refrigerant suction line insulation but 1" thick.

F. Insulation for equipment, valves, fittings, and flanges shall be premolded precut foamglass insulation, of the same thickness as used on adjacent piping. Jacketing shall be as specified for piping above.

G. Adhesives, sealers and tapes, for use in the application of insulation shall be as recommended by the insulation manufacturer, products of "Minnesota Mining and Manufacturing Co.", "Benjamin Foster", or "United Sheet Metal Company".

2.10 OTHER MATERIALS

A. All other materials not specifically described but required for a complete and proper installation, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that the work of this Section may be completed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the manufacturers' recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect.

2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 INSTALLATION OF EQUIPMENT

A. Locations: Install all equipment in the locations shown on the approved Shop Drawings, except where specifically otherwise approved on the job by the Architect.

B. Install in accordance with manufacturer’s published instructions.

C. Secure to concrete runners with properly sized stainless steel anchor bolts. Number of anchor bolts shall at least equal the number of anchor holes provided with the packaged cooling units.

D. Interferences: Avoid interference with structure, and with work of other trades, preserving

adequate headroom and clearing all doors and passageways to the approval of the Architect.

E. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

F. Pump baseplates shall be leveled, grouted, and bolted in place. Alignment of pumps shall be checked before start-up.

G. Vent cocks shall be provided on high points of the pump casings. Drain piping shall be provided from the drain connections of the pump baseplates terminating above the nearest floor drain.

H. Eccentric reducers shall be used if necessary to provide reduction from line size to pump connections. Eccentric reducers shall be installed level on top. Provide cold water piping to the mechanical seals of pumps as necessary. Cold water piping to pump seals shall connect to the domestic water lines after the backflow preventer and shall have individual gate valves and normally closed solenoid valves wired to open only when the particular pump served is in operation.

3.3 PIPING SYSTEMS

A. Piping shall be installed straight and plumb, parallel to building walls and columns, with due allowance for expansion and contraction.

B. Risers shall be provided with hangers at the horizontal line, within 6" of the riser.

C. All connections to equipment, valves and accessories shall be provided with unions or flanged joints, unless such items have flanged connections for easy removal.

D. Connections between piping of dissimilar metals shall be provided with dielectric unions.

E. All high points in the chilled water piping systems where air may tend to accumulate shall be provided with 1/4" gate valves for venting.

F. All equipment shall be provided with isolation gate or butterfly valves except where piping and valve arrangement for equipment is such that the same can be isolated without additional isolation valves.

G. Piping Accessories

1. Thermometers: Thermometers shall be provided as indicated. Thermometers shall be installed complete with thermometers wells.

2. Thermometer Wells: Thermometer wells shall be provided at all inlets and outlets of each air handling unit and each fan-coil unit.

3. Pressure Gages: Gages shall be provided as indicated.

4. Pressure Gage Cocks: Gage cocks shall be provided at three locations on each air handling unit. Downflow from by-pass line at inlet connection, and upstream and downstream of 3-way control valve and balancing valve. Gage cocks shall be provided at inlet and outlet of each fan-coil unit.

H. All drain piping shall be pitched, preferably at 1/4" per foot, 1/8" per foot minimum in the direction of flow, adequate cleanouts shall be provided in changes of direction to facilitate rodding.

3.4 DUCTWORK

A. Provide bracing for all ducts in accordance with SMACNA Seismic Restraint Manual.

B. All medium pressure air conditioning ducts and make-up air ducts shall be fabricated and erected in accordance with the SMACNA High Pressure Duct Construction Standards. All joint shall be sealed air tight by soldering all joints or by use of duct sealers. Rectangular duct reinforcement shall be in accordance with the table for 3" W.G. static pressure. The following ducts are medium pressure duct:

1. All supply ducts from air handling unit and package cooling units to variable air volume air terminals.

2. All supply ducts from air handling unit to variable air volume control box.

C. Low pressure galvanized steel air conditioning ducts shall be fabricated and erected in accordance with the SMACNA HVAC Construction Duct Standards, Metal and Flexible. Beading and crossbreaking are both acceptable. Longitudinal seams shall either be the Pittsburgh lock or Acme locked grooved seam. Button punch snap lock may be used with 1/2" pocket depth for gauge 26 material, 1/2" or 5/8" for gauge 24 and 5/8" for heavier material. Round elbows with standard elbows may be used in lieu of rectangular vaned elbow.

D. Fire dampers shall be provided on all ducts passing through fire-rated walls and partitions and as indicated. All fire dampers shall have gasketed 6" x 6" access panels on the fusible link side of the dampers. Installation shall be in accordance with SMACNA Fire damper guide.

E. All square elbows in all ductwork shall be provided with double thickness turning vanes. All branch take-offs shall be provided with adjustable air extractors.

F. All inlet and outlet connections to equipment shall be provided with neoprene-coated flexible duct connections.

G. All joints in toilet exhaust ductwork shall be taped with adhesive polyethylene cloth tape.

H. Duct dimensions shown are net inside dimensions.

I. All hood exhaust ducts shall be fabricated and erected in accordance with NFPA 96 and the Uniform Mechanical Code, with liquidtight continuous external weld. Provide access openings for cleaning and inspection at each change in direction.

J. Leakage Test - High Pressure Ducts

1. Testing apparatus shall include a portable rotary blower, an orifice assembly with straightening vanes and orifice plate mounted in a straight tube with properly located pressure taps, and U-tube manometers.

2. Test for audible leaks as follows

a. Close off and seal all openings in the duct section to be tested. Connect the test apparatus to the duct by means of section of flexible duct.

b. Start the blower with its control damper closed (some small blowers popularly used for testing ducts may damage the duct because they can develop pressures up to 25 inches. W.G.).

c. Gradually open the inlet damper until the duct pressure reaches 2-inches W.G. in excess of design duct operating pressure. Determine test pressure by using a U-tube manometer. Note that the pressure is indicated by the difference in level between the two legs of the manometer and not by the distance from zero to the reading on one leg only.

d. Survey all joints for audible leaks. Mark each leak and repair after shutting down blower. Do not apply a retest until sealants have set.

3. After all audible leaks have been sealed; the remaining leakage should be measured with the orifice section of the test apparatus as follows

a. Start blower and open dampers until pressure in duct reaches 25% in excess of designed duct operating pressure.

b. Read the pressure differential across the orifice using the manometer. The leakage rate in cfm is read directly from the calibration curve of the orifice plate. If there is no leakage, the pressure differential will be zero.

c. If all audible leaks have been corrected, it is unlikely that the measured leakage will exceed one (1) percent of capacity. If it does, the leaks must be located by more careful listening or by feeling along the joint.

d. It should be noted that even though a system may pass the measured leakage test, a concentration of leakage a one point may result in a noisy leak which, of course, must be corrected.

3.5 INSULATION

A. All air conditioning ducts shall be provided with external duct insulation applied per insulation Manufacturer's Published Instructions.

B. Air conditioning ducts outdoors shall be additionally insulated with 1" thick spray on urethane insulation, after duct erection.

C. Chilled Water Lines, Condensate Lines, and lines connected to, up to within 3 feet of the chilled water lines shall be insulated. Piping shall not be insulated at joints until tested, approved, and painted. Self-sealing adhesive strips shall be pressed in place only with nylon tools to be provided for that specific purpose.

D. Pumps, expansion tank, air separator and chemical feeder shall be insulated with cut and fitted foamglass insulation.

3.6 INSTALLATION OF REGISTERS AND DIFFUSERS

A. Install and connect all registers and diffusers, in the locations shown on the approved Shop Drawings, securely anchoring each item in place and sealing with rubber gaskets to

prevent leakage.

3.7 INSTALLATION OF AIR TERMINALS

A. Install air terminals in accordance with manufacturer's published installation instruction.

3.8 EQUIPMENT IDENTIFICATION

A. Equipment labels: All equipment furnished and installed under this Section shall be provided with the manufacturer's metal identification labels securely attached to each individual piece of equipment, and showing complete and comprehensive performance characteristics, size, model number, and serial number.

3.9 AIR SIDE BALANCING AND TESTING REQUIREMENTS

A. Constant Volume Systems

1. Set all supply and return volume dampers, air outlets, air extractors, and distribution grids to full open position. Set all controls for full cooling operating. Adjust outside air volume dampers for proper cfm.

2. Drill all probe holes for static pressure readings, pitot tube traverse readings, and temperature readings. Check motor electric current supply and rated running amperage of fan motor. Check fan and motor speeds. Set fan rpm to deliver not more than 10% over design cfm.

3. Make first complete air distribution run throughout entire system, recording first run statistics. Make second complete air distribution run throughout entire system for check on proper proportion of air.

4. Using pitot traverse, set all dampers to deliver proper amount of air to all areas, set branch line dampers to deliver proper amount of air to air outlets in each zone. Read cfm at each outlet and adjust to meet requirements.

3.10 WATER SIDE BALANCING AND TESTING REQUIREMENTS

A. Balancing of water side shall be done after balancing of air side is completed.

B. Remove and clean all strainers or clean strainers through blow-off valves. Examine water in the system and make sure water has been treated and cleaned. Check pumps rotation. Check expansion tank and ensure that the tank is not air bound or waterlogged and the system is full of water. Check and vent all high points in the system. Check operation of control valves.

C. Set chilled water pump to design gpm. Adjust flow through chiller. Check entering and leaving water temperatures through chiller and set to correct design temperatures. Balance chilled water flow through cooling coils. Upon completion of flow readings and adjustments at coils, tag and mark all settings and record data. Recheck settings at pumps and chiller and make necessary adjustments. Take pressure drop readings through coils at set flow rate on call for full cooling. Set pressure drop across bypass valve to match coil full flow pressure drop. At each cooling coil, check and record entering and leaving temperatures, pressure drop across coil, and pressure drop across bypass valve. Check and record suction and discharge pressures and total dynamic heat at each pump.

3.11 TEST REPORTS

A. Completed test report forms and data sheets be submitted in triplicate after testing and balancing is completed. Report form and data sheets shall be as follows:

1. Air Outlet Test Report - Similar to the following:

OUTLET TEST REPORT

Project _____ Sheet ____ of
System _____ Zone #
Job # _____ Date

Outlet Number	Location Type	Outlet Size	Outlet FPM	Outlet CFM	Factor Req. Field FPM	Factor Req. Field CFM	Test 1 Final FPM	Test 1 Final CFM

2. Air Handling Unit Test Report - Similar to the following:

AIR HANDLER TEST REPORT

Project_____Sheet_____of
System_____Floor #_____Zone #
Job #_____Date

Remarks _____

Item	Specified	Field Test 1	Field Test 2	Field Test 3
Outside air cfm				
Total air cfm				
% outside air				
Discharge duct sq. ft.				
Discharge duct fpm				
Return duct sq. ft.				
Return duct fpm				
Return air cfm				
Manufacturer				
Fan size				
Arrangement				
Fan blade				
Fan sheeve				
Motor sheeve				
No. rows coil				
Filters				
Rpm				
Hp				

Bhp
Volts
Phase
Cycle
Full-load amps
No-load amps
Heaters: rated amps

Suction sp
Discharge sp
Total sp
Ent. DB temperature
Ent. WB temperature
Lvg. DB temperature
Lvg. WB temperature
Outside air temperature
Gpm circulating H_2O
Pressure drop
Ent. water temperature
Lvg. water temperature

Remarks:

3. Chiller Data Sheets - indicating time and date of test, chilled water flow, chilled water entering and leaving temperatures and pressures, refrigerant suction and discharge pressures, oil pressures, actual current characteristics to chiller compressor motors, motor running currents, and all data indicated on chiller nameplate.

4. Exhaust Fan Data Sheets - indicating all data on fan nameplate, current characteristics to fan motor, suction and discharge static pressures, total fan cfm, and cfm through each exhaust registers.

5. All other readings required to be recorded under balancing and test requirements.

3.12 CLOSING-IN OF UNINSPECTED WORK

A. General: Do not allow or cause any of the work of this Section to be covered up or enclosed until it has been inspected, tested, and approved by the Architect and by all other authorities having jurisdiction.

B. Uncovering: Should any of the work of this Section be covered up or enclosed before it has been completely inspected, tested, and approved, do all things necessary to uncover all such work. After the work has been completely inspected, tested, and approved, provide all materials and labor necessary and make all repairs necessary to restore the work to its original and proper condition at no additional cost to the Owner.

3.13 COOPERATION WITH OTHER TRADES

A. Do all things necessary to cooperate with other trades in order that all systems in the Work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

3.14 TESTING

A. General: Provide all necessary personnel, equipment, and services and perform all tests necessary to demonstrate the integrity of the completed installation to the approval of the Architect and all other authorities having jurisdiction. Make all adjustments necessary to balance the completed system in accordance with the data shown on the Drawings.

B. Piping Systems Test: Contractor shall make preliminary tests on piping systems and correct all leaks and faults detected. The system shall then be subjected to final tests which shall be observed by the Engineer. The Contractor shall notify the Engineer of testing schedules 2 days before the final tests.

C. Chilled water piping systems shall be hydrostatically tested to 1-1/2 times their respected pump heads but not less than 150 psig for 2 hours.

D. Architect's Right to Retesting

1. Should the Contractor refuse or neglect to make any tests necessary to demonstration of the integrity of the completed system, the Architect may retain the services of an outside consultant to make all such tests and their resulting adjustments and balance.

2. The costs for such test shall be deducted from amounts owing to the Contractor and shall not be borne by the Owner.

E. Air Balancing: Perform in accordance with SMACNA HVAC Systems Testing, Adjusting, and Balancing Manual.

3.15 INSTRUCTING

A. Upon completion of all required testing and balancing, and at a date set by the Architect to coincide with the Owner's acceptance of the completed Work, furnish all necessary personnel and thoroughly indoctrinate and instruct the Owner's maintenance and operation personnel in all aspects of operation and maintenance of the installed systems. Demonstrate the contents of the Operation and Maintenance Manual and ensure that the Owner's personnel are thoroughly familiar with all aspects of operation and maintenance of the installed systems.

--END OF SECTION--

SECTION 15900

CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplemental Conditions and Division I Sections, apply to the work of this Section with additions and modifications specified herein.

B. The Contractor shall consult the following Sections in detail to determine his responsibilities for the work specified herein:

Section 15000: Mechanical General Requirements
Section 15500: Air Conditioning and Ventilation System

1.2 SCOPE OF WORK

A. This Section of the work includes all labor, equipment and materials for installation of valves, dampers and operators on new mechanical equipment. This shall include, but not be limited to the following where specified:

1. Chilled water control valves and operators.

2. Motorized air dampers and operators.

1.3 SUBMITTALS

A. Refer to Conditions of the Contract and Division 1, General Requirements for submittal requirements.

B. Submit physical and performance data for the following for approval:

1. Motorized air dampers and operators.

2. Control valves (with sizing calculations) and operators.

PART 2 - PRODUCTS

2.1 CHILLED WATER AUTOMATIC CONTROL VALVES

A. Approved Manufacturers: Air Conditioning Equipment Manufacturer.

B. Construction:

1. Two way bronze body and trim throttling plug valves rated for 250 PSIG pressure and equipped with stainless steel trim and replaceable composition disc.

2. Screwed ends, except valves 2-1/2" and larger to be flanged

3. Pressure Drop: Valves sized for 5 PSID pressure drop +/- .5 PSID.

4. Valves shall have characterized throttling plugs for equal percentage flow of linear stem travel.

2.2 VALVE OPERATORS

A. Approved Manufacturer: Air Conditioning Equipment Manufacturer.

B. Operators shall be ungrounded two wire 0 to 10 VDC input with field selectable. ranges of 2 to 10 VDC. Operators shall be spring return unless otherwise indicated. The operator shall be powered by a 24 VDC external source and shall include visual stem indication with manual override capabilities. Enclosures shall be die cast aluminum. Ambient temperature range shall be 32F to 122F. Timing of operator shall a maximum of 70 seconds for full stroke operation.

C. Valve operator size and spring range shall be selected to cause valve to close against full system operating pressure.

2.3 AUTOMATIC CONTROL DAMPERS

A. Approved Manufacturer: Ruskin. (Dampers in the outside streams shall be manufactured to minimize degradation from the atmospheres. The damper motors are to be mounted outside of the air stream).

2.4 DAMPER OPERATOR

A. Approved Manufacturer: Air Conditioning Equipment Manufacturer.

B. Electronic damper operators shall be a type having an ungrounded two wire 0 to 10 VDC positioning signal input. The operator shall be switch selectable to determine damper shaft rotation and be supplied with 24 VAC external powers. Operators shall have damper position indicator. Operators shall be capable of operation in ambient range from -4F to 122F.

C. Operators shall provide calculated feedback for percent flow indication.

D. Operator and linkage shall be of adequate capacity to operate damper against system static pressure requirements.

E. Damper operators shall be provided for all automatic dampers.

1. Operators shall be spring return, unless otherwise indicated.

2. Operators for dual duct VAV terminal unit dampers shall be of the non-stall type and shall de-energize when the damper has reached either the operator or BAS determined position.

F. Where dampers are provided with equipment under another section of the specifications, the operators shall be provided under Section 15900 and shall be shipped to equipment manufacturer for factory installation and mounting.

PART 3 - EXECUTION

3.1 AUTOMATIC CONTROL VALVES

A. Install valves with provisions for complete access for repair and removal.

B. No valve larger than 1" shall be mounted on 90 degrees angle from vertical.

C. Provide stem lubricators on valves larger than 1".

3.2 VALVE AND DAMPER OPERATOR POWER SOURCE

A. Provide 24 VAC power sources, as required, for all electronic operators. Locate transformers in NEMA I enclosures suitable to dissipate the heat load of all transformers. Loading of transformers shall not exceed 90% of the rated output of the transformer. This contractor shall provide the primary source of power to the transformer from the locations provided under Division 16.

-- END OF SECTION --

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01. RELATED DOCUMENTS

This Section supplements all sections of Division 16, and shall apply to all phases of work specified, shown on the drawings, and required to provide all electrical systems complete and operable for the project. The work required under the Division is not limited to the work shown on the electrical drawings. Refer to site, architectural, structural and mechanical drawings, coordinate all such work to attain fully operational systems throughout the project. The intent of this specification is to provide a complete and operating electrical system in accordance with all Contract Documents.

1.02. WORK INCLUDED

Provide all labor, materials, services and skilled supervision necessary for the construction, erection, installation, connection, testing, and adjustment of all circuits and electrical equipment required by the Contract Documents, complete in all respects and ready for use.

1.03. SUPERVISION OF WORK

A. Electrical work shall be under the full supervision of a professional electrical engineer or a master electrician registered to practice in Guam. Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit a certification from the Professional Engineer or master electrician stating that the work will be done under his full supervision. At the conclusion of the work, prior to final inspection, submit certification that the work was done in accordance with electrical construction documents and the installation complies with the latest edition of the National Electrical Code.

1.04. COORDINATION OF WORK

A. Plan all work so that it proceeds with a minimum of interference with other trades. Coordinate all openings required for equipment and conduit required for work of other trades. Provide all special frames, sleeves and anchor bolts as required. Coordinate electrical work with the mechanical installation.

B. Work lines and established heights shall be in accordance with architectural drawings. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.

C. Lay out and coordinate all work well in advance to avoid conflicts or interference with other work in progress so that in the event of interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work, and without additional cost to the Owner. Conflicts arising from lack of coordination shall be the contractor's responsibility.

D. Maintain all code required clearance around electrical equipment. Unless specifically noted otherwise, establish the exact location of electrical equipment based on the actual dimensions of equipment furnished.

1.05. COOPERATION WITH OTHER TRADES

A. Cooperate and coordinate all work of Division 16 with that of other trades; afford reasonable opportunity for the execution of their work. Properly connect and coordinate this work with the work of other trades at such time and in such a manner as not to delay or interfere with their work.

B. Examine the drawings and specifications for the general and mechanical work and the work of other trades. Coordinate this work accordingly.

C. Promptly report to the Contracting Officer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation or make it unsuitable to connect with or receive the work of others. Failure to report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.06. CODES, PERMITS AND FEES

A. Perform work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code". Where the Contract Documents exceed minimum requirements, the most stringent shall apply unless variance is approved.

B. Comply with all requirements for permits, licenses, fees, and codes. Obtain all required permits, licenses, inspections, and pay all fees required to perform the work described in the Contract Documents.

C. Comply with all requirements of the applicable utility authorities serving the project. Make all arrangements with the utility authorities for proper coordination of the work.

1.07. MATERIALS AND EQUIPMENT FURNISHED BY OTHERS

The electrical work includes the installation or connection of certain materials and equipment furnished by others. Verify installation details. Foundations for apparatus and equipment will be furnished by others unless otherwise noted or detailed.

1.08. CONTRACT DRAWINGS

The Contract Drawings are shown in part diagrammatic, and intend to convey the scope of work, indicating the intended general arrangement of equipment, conduit and outlets. Follow the drawings in laying out the work and verify spaces for the installation of materials and equipment based on actual dimensions of equipment furnished. Wherever a question exists regarding the intended location of outlets or equipment, circuiting, etc., obtain instructions from the Contracting Officer before proceeding with the work.

1.09. EQUIPMENT OR FIXTURES

Equipment or fixtures shall be connected to provide circuit continuity in accordance with applicable codes whether or not each piece of conductor, conduit, or protective device is shown between such items of equipment or fixtures, and the point of circuit origin.

1.10. NEW EQUIPMENT AND MATERIAL

A. Unless otherwise specified, equipment and materials of the same type of classification, and used for the same purpose shall be products of the same manufacturer. Use only new and unweathered material.

B. Furnish products listed and classified by Underwriter's Laboratories, Inc.

1.11. APPLICABLE DOCUMENTS

A. Design, manufacture, testing and method of installation of all apparatus and materials furnished under Division 16 of the specifications shall conform to the latest publications or standard rules of the following:

Institute of Electrical and Electronic Engineers
(Formerly American Institute of Electrical Engineers) - IEEE
National Electrical Manufacturers' Association - NEMA
Underwriters' Laboratories, Inc. - UL
National Fire Protection Association - NFPA
American Society for Testing and Materials - ASTM
American National Standards Institute - ANSI
National Electrical Code - NEC
National Electrical Safety Code - NESC
Uniform Fire Code - UFC
Uniform Building Code - UBC
Insulated Power Cable Engineers Association - IPCEA
American with Disability Act - ADA
American Institute of Steel Construction - AISC
Department of Public Works Standards, Government of Guam - DPW
Guam Fire Department Standards, Government of Guam - GFD
Guam Power Authority Standards, Government of Guam - GPA
Guam Telephone Authority Standards, Government of Guam - GTA

1.12. EXECUTION OF THE WORK

A. Install equipment and materials in neat and workmanlike manner and align, level and adjust for proper operation. Install equipment so that all parts are easily accessible for inspection, operation, maintenance, and repair.

B. Where damage, marring or disfigurement has occurred, replace or refinish the damaged surfaces as directed, and to the satisfaction of the Contracting Officer.

C. Provide the design, fabrication, and erection of all supplementary structural framing required for attachment of hangers or other devices supporting electrical equipment. Submit design/shop drawing to the Contracting Officer for approval.

D. Outlet Location:

1. Position of outlets: Center all outlets with regard to panelling, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed. Repair or replace damaged finishes. Set outlets plumb and extend to the finished surface of the wall, ceiling or floor without projecting beyond same.

1.13. SPECIAL CONSIDERATION

A. Cutting, Patching and Piercing: Obtain written permission from the Contracting Officer before cutting or piercing structural members.

1. Use craftsmen skilled in their respective trades for cutting, fitting, repairing, patching of plaster and finishing of materials including carpentry work, metal work or concrete work required for by Division 16. Do not weaken walls, partitions or floor by cutting. Holes required to be cut in floors must be drilled or cored without breaking or spalling around the holes. Do all necessary patching and/or refinishing as instructed by the Contracting Officer.

2. Sleeves through floors and walls to be galvanized rigid steel flush with walls, ceiling or finished floors; size to accommodate the raceway.

3. Use care in piercing waterproofing. After the part piercing waterproofing has been set in place, seal opening and make absolutely watertight.

4. Provide baked white enamel painted spring-clipped escutcheon plates where exposed pipe passes through walls, floors, or ceilings. Cover sleeves and entire opening made for the pipe with escutcheon plates. Field applied paint finish shall match color of surrounding finish. Seal all conduit openings through floor slabs, masonry walls, and continuous partitions to make air and watertight. Tightly caulk space between conduit and abutting materials with fiberglass insulation and nonflammable sealant.

5. All through wall, floor, or ceiling penetrations must be properly sealed with UL Listed fire-stopping material.

B. Seal equipment or components exposed to the weather and make watertight and insect-proof. Protect equipment outlets and conduit openings with temporary plugs or caps at all times that work is not in progress.

C. Equipment Identification: Identify each piece of equipment including disconnect switches and motor starters, with plastic laminate nameplates, black face with white core letters, having proper and complete identification. Clearly identify on the equipment served, and spell out the full name of the equipment, such as "Air Handling Unit AHU-1" and "Hot Water Cir. Pump P-1". Do not use abbreviated plan references such as "AHU-1" or "P-1".

D. Equipment Access: Locate starters, switches, receptacles, and pull boxes to allow easy access for operation, repair and maintenance, and if concealed, provide access doors.

E. Equipment Bases: Provide equipment bases on all floor-mounted equipment furnished under this Contract.

F. Protection of apparatus, materials and equipment: Take all necessary precautions to properly protect all apparatus, fixtures, appliances, material, equipment and installations from damage of any kind. The Contracting Officer may reject any particular piece or pieces of material, apparatus, or equipment which has scratches, dents or otherwise damaged.

G. Operation and Maintenance Manuals: During the time of the Contract and before final acceptance of the electrical installation, submit to the Contracting Officer three copies of all descriptive literature, maintenance recommendations from the equipment manufacturer, data of initial operation, wiring diagrams and parts list of each item of electrical equipment installed under the Contract; submit all manufacturer's guarantees and warranties.

1. Refer to Division 1 for additional requirements.

H. Painting Preparation: Prepare all exposed fittings, boxes, supports and panelboards for painting; remove traces of oil, grease and dirt. Employ all necessary precautionary methods to prevent scratching or defacing of all electrical apparatus and devices.

I. Painting: Exposed conduit, boxes installed after room has been painted, shall be painted to match room finish by this contractor.

1. Corrosion Control: All corrosive metal surfaces, conduits/fittings, pipelines and structures shall be provided with corrosion inhibiting primer before installation. Appropriate surface preparation shall be made before application of primer.

J. Rust Prevention: Provide hot dip galvanized finish for all ferrous materials. In addition, outdoor installations shall be field painted with two coats of epoxy paint.

K. Tests: Provide all tests as outlined hereinafter, and other tests necessary to establish the adequacy, quality, safety, completed status, and suitable operation of each system. Tests shall be conducted in the presence of the Contracting Officer.

1. Insulation resistance of conductors.

L. Seismic Consideration: Installation shall meet Seismic requirements per IBC 2018.

M. Windload Consideration: Installation exposed to outdoors shall be designed to withstand wind load requirements per IBC 2018.

1.14. QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Division.

B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Division in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.

1.15. ELECTRICAL SERVICE

A. Electrical service to the building is as indicated on the drawings.

B. Make all necessary arrangements with the serving utilities, and pay all costs and fees, assessed to the project by the serving utilities. All work shall be in accordance with serving utilities standards and subject to their approval.

1.16. PRODUCT HANDLING

Comply with pertinent provisions of Division 1.

1.17. WARRANTY

Provide one year warranty on all labor and materials.

1.18. AS-BUILT DRAWINGS

A. The Contractor shall maintain at the site one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, in good order and marked to record all changes made during construction. These shall be made available to the Contracting Officer.

B. At the conclusion of the work, the Contractor shall submit “As-Built” drawings, 2 sets in CD-Rom in PDF and AutoCAD 2014 format and a copy of Mylar drawings. As a condition for acceptance of work, "as-built" reproducibles shall be signed by Contractor attesting that all changes have been incorporated, dated and delivered to the Contracting Officer.

1.19. SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

END OF SECTION

SECTION 16402
INTERIOR WIRING SYSTEMS

PART 1 - GENERAL

1.01. RELATED REQUIREMENTS: Section 16050, "Basic Electrical Materials and Methods," applies to this section with additions and modifications specified herein.

1.02. SUBMITTALS

A. Shop Drawings - Submit for the following:

Disconnect Switch

B. Manufacturer's Data:

Conduit and fittings (each type)
Insulated conductors
junction boxes

C. Test Reports: Submit test results for approval in report form.

1. 600-volt wiring test.

PART 2 - PRODUCTS

2.01. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of UL, where UL standards are established for those items, and the requirements of NFPA 70.

2.02. CONDUIT AND FITTINGS

A. Rigid Aluminum Conduit: ANSI C80.5, UL 6.

B. Rigid Nonmetallic Conduit: PVC Type EPC-40, in accordance with NEMA TC2 fiberglass conduit in accordance with NEMA TC14.

C. Plastic-Coated Rigid Steel and IMC Conduit: NEMA RN1, Type 40 (40 mils thick).

D. Flexible Metal Conduit: UL 1.

1. Liquid-Tight Flexible Metal Conduit (Steel): UL 360.

E. Fittings for Metal Conduit and Flexible Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

1. Fittings for Rigid Metal Conduit and IMC: Threaded type. Split couplings unacceptable.

F. Fittings for Rigid Nonmetallic Conduit: NEMA TC3.

2.03. OUTLET BOXES AND COVERS: UL 514A, cadmium- or zinc-coated, if of ferrous metal. UL 514C, if nonmetallic.

2.04. CABINETS, JUNCTION BOXES AND PULL BOXES (WITH VOLUME GREATER THAN 100 CUBIC INCHES): UL 50, hot-dip zinc-coated, if of sheet steel.

2.05. WIRES AND CABLES: Wires and cables shall meet the applicable requirements of NFPA 70 and UL for the type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to the site shall not be used.

A. Conductors: No. 10 AWG and smaller shall be solid; No. 8 AWG and larger shall be stranded. Conductors shall be copper, unless indicated otherwise.

1. Minimum Conductor Sizes: Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; and for Class 2 Low-energy, remote-control and signal circuits, No. 16 AWG.

B. Color Coding: Provide for all service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors, and white for neutrals, except where neutrals of more than one system are installed in same raceway or box, the other neutral shall be white with a colored (not green) stripe. The color of the ungrounded conductors in different voltage systems shall be as follows:

1.	120/208 volt, 3-phase:	Phase A - black Phase B - red Phase C - blue
2.	277/480 volt, 3-phase:	Phase A - brown Phase B -orange Phase C -yellow
3.	120/240 volt, single phase:	red and black.

C. Insulation: Unless specified or indicated otherwise or required by NFPA 70, all power and lighting wires shall be 600-volt, Type THW, THWN, XHHW, or RHW, except that grounding wire may be Type TW; remote-control and signal circuits shall be Type TW, THW or TF. Conductors shall conform to UL 83. Where lighting fixtures require 90 degree C conductors, provide only conductors with 90 degree C insulation or better.

D. Bonding Conductors: ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.06. SPLICES AND TERMINATION COMPONENTS: UL 486A for wire connectors, and UL 510 for insulating tapes. Connectors for wires No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.07. SWITCHES

A. Disconnect Switches: NEMA KS1. Switches serving as motor-disconnect means shall be horsepower rated. Provide heavy duty type switches where indicated, where switches are rated higher than 240 volts, and for double throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Provide switches in NEMA enclosure as indicated, per NEMA ICS 6.

2.08. ENCLOSED CIRCUIT BREAKERS: UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit interrupting rating as indicated. Enclosure type as indicated. Provide solid neutral.

2.09. FUSES: NEMA FU 1. Provide a complete set of fuses for each fusible switch as required. Time-current characteristics curves of fuses serving motors or other circuit protective devices shall be coordinated for proper operation. Fuses shall have a voltage rating not less than the circuit voltage.

A. Cartridge Fuses, Current-limiting Type (Class R): UL 198E, Class RK-1, RK-5 time-delay type. Associated fuseholders shall be Class R only.

2.10. GROUNDING AND BONDING EQUIPMENT: UL 467. Ground rods shall be copper-encased steel, with minimum diameter of 3/4 inch and minimum length of 10 feet.

2.11. CONTACTOR: NEMA ICS 2, electrically operated, mechanically held contactor rated as indicated. Provide in NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts and coil clearing contactor with hand-off automatic selector switch.

2.12. NAMEPLATES: Fed. Spec. L-P-387. Provide as specified in Section 16050, "Basic Electrical Materials and Methods."

2.13. SOURCE QUALITY CONTROL: Test opening around electrical penetrations through fire resistive-rated walls, partitions, floor or ceiling for fire resistive integrity in accordance with ASTM E 814.

PART 3 - EXECUTION

3.01. INSTALLATION: Electrical installations shall conform to requirements of NFPA 70 and to requirements specified herein.

A. Underground Service: Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.

1. Labels: Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicated number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels. Use lettering of at least 0.25 inch in height, and engrave on black-on-white matte finish. Service

entrance disconnect devices in more than one enclosure shall be provided only as permitted by NFPA 70.

B. Wiring Methods: Provide insulated conductors installed in conduit, except where specifically indicated or specified otherwise, or required by NFPA 70 to be installed otherwise. Provide insulated, green equipment grounding conductor in all feeder and branch circuits, including lighting circuits. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated, green conductor for grounding conductors installed in conduit or raceways. Minimum conduit size shall be 1/2 inch in diameter for low voltage lighting and power circuits. Vertical distribution in multiple story buildings shall be made with metal conduit in fire-rated shafts. Metal conduit shall extend through shafts for minimum distance of 6 inches. Conduit which penetrates fire walls, fire partitions, or floors shall be metallic on both sides of fire walls, fire partitions, or floors for minimum distance of 6 inches.

1. Aluminum Conduit: Use in exposed installation and in unairconditioned spaces.

   a. Do not install underground or encase in concrete.

   b. Do not use brass or bronze fittings.

2. Nonmetallic Conduit:

   a. Underground Conduit: PVC, Type EPC-40; or fiberglass.

   b. Conduit Embedded in Concrete: PVC, Type EPC-40.

   c. Restrictions applicable to PVC Schedule 40 and PVC Schedule 80:

      (1) Do not use in areas subject to severe physical damage (including, but not limited to, mechanical equipment rooms, electrical equipment rooms, etc.).

      (2) Do not use in hazardous areas.

      (3) Do not use in penetrating fire-rated walls or partitions, fire rated floors, etc.

C. Conduit Installation: Unless indicated otherwise, conceal conduit within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot-water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.

1. Where conduits rise through floor slabs, the curved portion of bends shall not be visible above the finish slab.

2. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. The load applied to fasteners shall not exceed one-fourth of the proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and

shock resistant. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4-inch in concrete joints shall not cut the main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet-metal screws. In suspended-ceiling construction, run conduit above the ceiling. Spring steel fasteners may be used for lighting branch circuit conduit supports in suspended ceiling in dry locations.

3. Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with a hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of all obstructions.

4. Install pull wires in empty conduit in which wire is to be installed by others. The pull wire shall be plastic having minimum 200-pound tensile strength. Leave a minimum 12 inches of slack at each end of the pull wire.

5. Conduit Installed in Concrete Floor Slabs: Locate so as not to adversely affect the structural strength of the slabs. Install conduit within the middle one-third of the concrete slab. Do not stack conduits. Space conduit horizontally minimum three diameters except at cabinet locations. Curved portions of bends shall not be visible above the finish slab. Increase slab thickness as necessary to provide a minimum one-inch cover over conduit. Where embedded conduits cross expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Conduit larger than one-inch trade size shall be parallel with or at right angles to the main reinforcement; when at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit is used, raceway must be converted to plastic coated rigid steel before rising above floor, unless specifically indicated otherwise.

7. Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use minimum single locknut and bushing. Locknuts shall have sharp edges for digging into the wall of metal enclosures. Install bushings on the ends of conduits and provide insulating type where required by NFPA 70.

8. Stub-Ups: Provide conduits stubbed up through concrete floor for connection to free-standing equipment with an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above the floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

9. Flexible Connections: Provide flexible connections of short length, 6 feet maximum, for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Provide liquid-tight flexible conduit in wet locations. Provide separate ground conductor across flexible connections.

D. Boxes, Outlets and Supports: Provide boxes in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be of the cast-metal hub type when located in wet locations, when

surface mounted on outside of exterior surfaces, when installed exposed up to 7 feet above interior floors and walkways, or when installed in hazardous areas. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit; nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have the volume required by NFPA 70 for the number of conductors enclosed in the box. Boxes for mounting lighting fixtures shall be minimum 4 inches square or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Boxes for use in masonry-block or tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by the fixture terminal operating temperature; fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of the ceiling supports or make adequate provisions for distributing the load over the ceiling support members. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type fastener maximum 24 inches from the box. When penetrating reinforced-concrete members, avoid cutting any reinforcing steel.

1. Boxes for use with raceway systems shall be minimum 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting-fixture outlets shall be minimum 4 inches square, except that 4 inch by 2 inch boxes may be used where only one raceway enters the outlet. Telephone outlets shall be a minimum of 4 inches square by 1-1/2 inches deep.

2. Pull Boxes: Construct of at least the minimum size required by NFPA 70 of code-gage aluminum or galvanized sheet steel, compatible with nonmetallic raceway systems, except where cast-metal boxes are required in locations specified herein. Furnish boxes with screw-fastened covers. Where several feeders pass through a common pull box, tag the feeders to indicate clearly the electrical characteristics, circuit number, and panel designation.

3. Extension Rings: Used only on existing boxes in concealed conduit systems where wall is furred out for new finish.

E. Mounting Heights: Mount panelboards, circuit breakers, and disconnecting switches so the height of the operating handle at its highest position maximum 72 inches above the floor. Mount lighting switches receptacles and other devices as indicated. Measure mounting heights of wiring devices and outlets to the center of device or outlet.

F. Conductor Identification: Provide conductor identification within each enclosure where a tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated self-sticking markers, colored nylon cable ties and plates, or heat-shrink type sleeves. Identify control circuit terminations.

G. Splices: Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with an insulated pressure type connector. Make splices in conductors No.

8 AWG and larger diameter with a solderless connector and cover with an insulation material equivalent to the conductor insulation.

H. Electrical Penetrations: Openings around electrical penetrations through fire resistance rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity as tested per ASTM E 814.

I. Grounding and Bonding: In accordance with NFPA 70. Ground all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at the main service equipment and extend grounding conductor to the point of entrance of the metallic water service. Make ground connection to driven ground rods on the exterior of the building. Where ground fault protection is employed, ensure that the connection of ground and neutral does not interfere with the correct operation of the fault protection. Bond building foundation rebars to ground.

1. Grounding Conductor: Provide an insulated, green equipment grounding conductor in all feeder and branch circuits including lighting circuits. Grounding conductor shall be separated from the electrical system neutral conductor. Provide insulated, green conductor for grounding conductors installed in conduit or raceways.

2. Resistance: The maximum resistance to ground of the grounding system shall not exceed 25 ohms under normally dry conditions. Where the resistance obtained exceed 25 ohms provide additional ground rods to achieve the resistance level. Spacing of ground rods shall not exceed 10 feet apart.

J. Repair of Existing Work, Demolition, and Modification of Existing Electrical Distribution Systems:

1. Lay out the work carefully in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work. Repair any damage to buildings, piping, and equipment using skilled craftsmen of the trades involved.

2. Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

a. Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, fittings, etc., back to equipment's source.

b. Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

K. Motor Load: When motor size provided differs from the size indicated or specified, make adjustments to the wiring, disconnect devices, and branch circuit protection to accommodate the equipment actually provided.

3.02. FIELD QUALITY CONTROL: Furnish test equipment and personnel and submit written copies of test results to the Contracting Officer. Give five working days notice prior to each test.

A. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

B. Test on 600-Volt Wiring: Test all 600-volt wiring to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on all wiring No. 6 AWG and larger diameter using an instrument which applies a voltage of approximately 500 volts to provide a direct reading of resistance; minimum resistance shall be 250,000 ohms.

END OF SECTION

SECTION 16510
LIGHTING SYSTEM

PART 1 - GENERAL

1.01. GENERAL REQUIREMENTS: Section 16050, "Basic Electrical Materials and Methods", applies to this Section, with the additions and modifications specified herein.

1.02. DESCRIPTION OF WORK: The work includes providing lighting fixtures, photocell switches, time switches, contactors, battery-powered units and systems for interior use, including lighting fixtures and accessories mounted on the exterior surfaces of buildings. Materials not normally furnished by manufacturers of these devices are specified in Section 16402, Interior Wiring Systems.

1.03. SUBMITTALS: Data, shop drawings and reports shall employ the terminology, classifications and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting system specified.

A. Manufacturer's Data:

1 Lighting Fixtures, including Lamps and Ballasts or Drivers

2 Lighting Contactors

B. Shop Drawings:

1. Lighting fixture assemblies

PART 2 - PRODUCTS

2.01. PRODUCT MATERIALS: Furnish lighting fixtures completely assembled with wiring and mounting devices and ready for installation at the locations noted. Design and equip recessed fixtures in suspended ceilings for installation in the type of ceiling in which the fixture is to be installed. Design fixtures to be supported independent of the ceiling. Equip fixtures with the lamps required.

2.02. LED LIGHTING FIXTURES: Provide LED fixtures, conforming to UL Listed and as indicated. Fixtures shall have built in Surge Protective Device.

A. LED Lamps: Provide as indicated.

2.03. RECESS- AND FLUSH-MOUNTED FIXTURES: Provide type that can be relamped from the bottom, with access to ballast or driver from the bottom, with trim for the exposed surface of flush-mounted fixtures as indicated.

2.04. EQUIPMENT IDENTIFICATON

A. Manufacturer’s Nameplate: Provide each item of equipment with a nameplate bearing the manufacturer’s name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.05. FACTORY APPLIED FINISH: Provide electrical equipment with factory-applied painting systems which, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

2.06. SUSPENDED FIXTURES: Provide hangers capable of supporting twice the combined weight of the adjoining fixtures. Provide with swivel hangers to insure a plumb installation. Hangers shall be cadmium-plated steel with swivel-ball tapped for the conduit size indicated. Hangers shall allow fixtures to swing within an angle of 20 degrees. Brace pendants 4 feet or longer to limit swinging. Single-unit suspended fixtures shall have twin-stem hangers. Multiple-unit or continuous row fluorescent fixtures shall have a tubing or stem for wiring at one point and a tubing or rod suspension provided for each unit length of chassis, including one at each end. Rods shall be a minimum 3/16-inch diameter.

2.07. LIGHTING CONTACTOR: NEMA ICS 2, electrically operated, mechanically held contactor rated as indicated. Provide in NEMA 1 enclosure conforming to NEMA ICS 6. Contactor shall have silver alloy double-break contacts and coil clearing contacts and shall require no arcing contacts. Provide contactor with hand-off-automatic selector switch. Contactor shall be hermetically sealed.

2.08. EXIT SIGNS: UL 924, NFPA 70 and NFPA 101.

A. Exit signs shall be as indicated self-powered type.

B. Self-Powered Exit Signs (Battery Type): Provide with automatic power failure device, test switch, pilot light and fully automatic high/low trickle charger in a self-contained power pack. Battery shall be sealed wet or gel electrolyte type, operate unattended, and require no maintenance (including additional water) for a period of not less than 5 years.

2.09. EMERGENCY LIGHTING EQUIPMENT: UL 924, NFPA 70, and NFPA 101.

A. Emergency Lighting Unit: Provide as indicated and as shown. Units shall be equipped with brown-out sensitive circuit to activate battery when ac input falls to 75 percent of normal voltage.

PART 3 - EXECUTION

3.01 INSTALLATION: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved shop drawings. The installation shall meet with the requirements of NFPA 70. Mounting heights specified or indicated shall be to bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before installation is commenced and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Light fixtures shall be supported from building main structure. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and with at least two 3/4-inch metal channels spanning, and secured to, the ceiling tees. Provide rods or wires for lighting fixture support under this section of the specifications. Rods or wires shall conform to the requirements of Division 9. Additionally, for recessed fixtures, provide support clips securely fastened to ceiling grid members, a minimum of one at or near each corner of each fixture.

A. Exit and Emergency Lights: Wire exit light on separate circuits and serve from [an emergency panel. Wire emergency lights ahead of the switch to the normal lighting circuit located in the same room or area.

3.02. GROUNDING: Ground noncurrent-carrying parts of equipment as specified in Section 16402, "Interior Wiring System". Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.03. FIELD TESTS: The Contractor shall provide electric power required for field tests.

A. Operating Test: Upon completion of the installation, conduct an operating test to show that the equipment operated in accordance with the requirements of this section.

B. Insulation Resistance Test: Perform as specified in Section 16402, "Interior Wiring Systems", both before and after connection of fixtures and equipment.

C. Ground Resistance Test: Perform as specified in Section 16402, "Interior Wiring Systems".

3.04. RELAMPING: Relamp luminaires which have failed lamps at completion of work.

3.05. ADJUSTING AND CLEANING:

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire finish at completion of work.

END OF SECTION