PROJECT MANUAL
Including Specifications
For construction of:

Concession Building Rebuild Misquamicut State Beach
257 Atlantic Avenue
Westerly, Rhode Island

For The
State of Rhode Island
Department of Environmental Management
Division of Planning and Development
235 Promenade Street
Providence, Rhode Island

Prepared by

Burgin Lambert Architects, Inc.
150 Bellevue Avenue
Newport, Rhode Island 02840

Date of Issue:
March 01, 2019

PROJECT DIRECTORY

OWNER:	State of Rhode Island and Providence Plantations Department of Environmental Management Division of Planning and Development 235 Promenade Street Providence, Rhode Island 02908 (401) 277-2776
ARCHITECT:	Burgin Lambert Architects Inc. 150 Bellevue Avenue Newport, R.I. 02840 (401) 847-3339
STRUCTURAL ENGINEER:	C. A. Pretzer Assoc. Inc. 50 Freeway Drive Cranston, RI 02920 (401) 785 2690
MECHANICAL ENGINEER:	Wilkinson Assoc., Inc. 615 Jefferson Boulevard Warwick, RI 02886 (401) 737-6382
ELECTRICAL ENGINEER:	BER 66 Main Street North Easton, MA 02356 (508) 230 0260

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RI DOA REQUIREMENTS

Refer to RI Department of Administration Requirements published separately for this project that are part of the Contract Documents.

GENERAL CONDITIONS

The General Conditions of the Contract shall be the "General Conditions of the Contract for Construction," AIA Document A201, edition at the time the Contract is awarded, as modified by the State of RI and DEM.

END OF SECTION

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Project identification: Misquamicut State Beach Concessions Building

B. Project summary:

1. Abbreviated written summary: Construct a new Building on the existing elevated platform. Include all required utilities below the floor and in the building.
2. Major systems: Timber Frame, cedar siding, asphalt shingle roof, wood framing, Kitchen Hood, Lightning Protection System, electrical, mechanical and plumbing systems.

C. Particular project requirements:

1. Existing site conditions and restrictions: During construction the public will be allowed parking spaces and access to the site. Visit the site to become familiar with existing conditions.
2. Contractor's use of facilities: Coordinate with the Owner the area needed for construction activities. The existing facility and parking areas will be open to the public during construction. Protect the public form injury during construction activities. Fence off all work areas and secure form the public.

D. Permits and Fees: Apply for, obtain, and pay for permits, fees and utility company backcharges required to perform the work including a State Building Permit and Rhode Island Department of Transportation Utility Permit. Submit copies to Owner. This project is exempt from State Sales Taxes. The Contractor will be provided with the states sales tax Exemption Form upon request.

E. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Owner.

F. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.

G. Existing Conditions: Notify Owner of existing conditions differing from those indicated on the drawings. Do not remove or alter structural components without prior written approval.

H. Coordination:

1. Coordinate the work of all trades.
2. Verify location of utilities and existing conditions.

I. Installation Requirements, General:

1. Inspect substrates and report unsatisfactory conditions in writing.
2. Do not proceed until unsatisfactory conditions have been corrected.
3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
4. Install materials in exact accordance with manufacturer’s instructions and approved submittals.
5. Install materials in proper relation with adjacent construction and with proper appearance.

6. Restore units damaged during installation. Replace units which cannot be restored at no additional expense to the Owner.
7. Refer to additional installation requirements and tolerances specified under individual specification sections.

J. Definitions:

1. Provide: Furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.
2. Approved: Acceptance of item submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements. Refer to limitations of 'Approved' in General and Supplementary Conditions.
3. Match Existing: Match existing as acceptable to the Owner.

K. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonable implied or necessary for proper performance of the project shall be included.

L. Writing style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, 'Provide tile' means 'Contractor shall provide tile.'

M. Coordinate all subcontractors hired by the Owner as part of the Work. Owner will be retaining a telephone vendor and a security alarm vendor to install work in the building.

PART 2 - PRODUCTS - Not Applicable To This Section

PART 3 - EXECUTION - Not Applicable To This Section

END OF SECTION

SECTION 01011
SPECIAL INSPECTIONS

The State of Rhode Island requires special inspections in addition to those third party inspections specified in the Project Manual and Drawings. Special Inspections are to be conducted by inspectors and/or testing agencies that are engaged by the Owner or the Owner's Agent and not by the Contractor or Subcontractor. Typical special inspections may include items similar to: structural beam inspections, anchor bolt locations, structural connection inspections, steel welding inspections, wall to roof connections, shearwall inspection, and framing details.

The State Building Official prior to the start of construction will provide a list of special inspections to the Architect. This list will then be forwarded to the General Contractor. It is the Contractors responsibility to coordinate special inspections with the Owner's Agent (Architect, Structural Engineer, etc.) prior to the start of new work that would cover items needing inspection. The contractor is to create a master list of all Inspections and keep it on site for scheduling purposes.

END OF SECTION

SECTION 01012
CRMC Permit

PART 1 - GENERAL

1.01 SUMMARY

A. Attached is the CRMC assent for the project work.

END OF SECTION

State of Rhode Island and Providence Plantations
Coastal Resources Management Council
Oliver H. Stedman Government Center
4808 Tower Hill Road, Suite 3
Wakefield, RI 02879-1900

(401) 783-3370
Fax (401) 783-2069

Certificate of Maintenance

February 21, 2019

State of Rhode Island
235 Promenade St
Providence, RI 02908

RE: CRMC Assent No. M2019-02-077: Reconstruct fire damaged concession structure as per the approved building plans authorized by the R.I. State Building Official. Project Location: 257 Atlantic Avenue, Westerly; Plat 166, Lot 8

Dear Applicant:

The Coastal Resources Management Council has reviewed your project proposal and has determined that it conforms to RICRMP Section 1.3.1(N) and applicable standards. Construction authorized by this approval shall be limited to replacement, reconstruction, or rebuilding to approved, pre-existing conditions and dimensions of the above noted structure. This project must be completed within three (3) years of the date of this approval. If this project involves excess construction materials or debris, these materials shall be removed from the site and disposed of at a suitable legal upland location. No equipment access or storage of equipment, construction material or debris shall occur on coastal features. If the project involves earthwork, appropriate erosion controls shall be utilized. All applicable conditions of original CRMC Assents that pertain to this property shall be upheld unless otherwise modified by the CRMC. All applicable policies, prohibitions, and standards of the RICRMP shall be upheld.

A copy of this maintenance authorization to perform maintenance work shall be kept on site and available for inspection. The maintenance (blue) card must be posted on site during the duration of the project.

Sincerely,

Greg Baribault

Gregory Baribault, Engineering Tech IV
Coastal Resources Management Council

/bms

State of Rhode Island and Providence Plantations

COASTAL RESOURCES MANAGEMENT COUNCIL

MAINTENANCE ASSENT

CRMC Assent No.: M2019-02-077 Date: February 21, 2019

This certifies that State of Rhode Island has permission to Reconstruct fire damaged concession structure as per the approved building plans authorized by the R.I. State Building Official.

situated at 257 Atlantic Avenue
Plat No. 166 Lot No. 8

Said maintenance operations to be done in accordance with an application on file in the Offices of the Coastal Resources Management Council and subject further to all the provisions of the building ordinances of the :

City/Town of **Westerly**

and to all the applicable State, Local and Federal provisions. This assent shall expire three years from the date of this assent.

Brittany Zarlenga
Official Designee
Coastal Resources Management Council

THIS CARD MUST BE DISPLAYED IN A CONSPICUOUS PLACE ON THE PREMISES.
FAILURE TO DISPLAY WILL RESULT IN LEGAL ACTION.

SECTION 01015
CONTRACTOR'S USE OF THE PREMISES

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: this section applies to situations in which the contractor or their representatives including, but not limited to, suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.

B. Related work: Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

C. This is a public facility and is open to the public year-round. The beach season runs from Memorial Day to Labor Day. This is a popular public beach and the contractor must work while the public uses the beach and open areas of the site.

D. The Contractor is responsible to secure the site within the work area during construction. The beach and restricted areas of the parking lot will be open to the public during construction. The site has limitations to where the Contractor can use the site during construction. In general the area around the building is for Contractors' use during construction of the building. The Contractor is restricted to the use of the entire building site and the adjacent parking lot and as required to make utility connections on public property only. Obtain Owners approval for the locations of fencing, trailers and material storage areas as to not interfere with Owners and Public use of the site. Coordinate location of construction materials, fencing, storage, trailers, containers, sanitary facilities and the like with Owner activities and public use of the beach and public use of the parking lot and locate and or relocate these items as deemed necessary by the Owner throughout the construction process.

E. Storage of materials, storage containers, porta-johns and temporary field office trailers and fabrication on land can occur in the parking lot within the limits the limits established by the Owner and within the time frame established by the Owner. Items may be needed to be relocated due to the construction schedule in coordination with the public's use of the beach and the season at which construction activities are occurring. The parking lot may be used for parking of employee's vehicles during working hours subject to location approved by the Owner. Use of the parking lot must be coordinated with and approved in advance by the Owner. Public access through the parking lot is required to be maintained.

F. The Contractor shall ensure that no demolition materials, no construction materials, no nails or fasteners, no hardware, no material scraps such as shingle pieces and trim pieces shall be allowed to fall and remain on the sand below and around the construction site. Contractor shall ensure that nails do not fall onto the sand during construction activities. No construction materials shall be allowed to remain on the sand dunes. Contractor shall remove all construction materials and equipment that accidentally falls onto the sand during construction immediately before it is transported by wind or rain and before it is covered by blowing sand.

1.2 QUALITY ASSURANCE:

A. Promptly upon award of the contract, notify all pertinent personnel regarding requirements of this section.

B. Require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this section.

1.3 TRANSPORTATION FACILITIES:

A. Truck, equipment and contractor's vehicle access:

1. Provide adequate protection for curbs, dunes, site improvements, the existing site and building improvements, and sidewalks and parking areas over which trucks and equipment pass to reach the job site.
2. Refer to section 01500 for additional temporary facility requirements.

END OF SECTION

SECTION 01045
CUTTING AND PATCHING

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: This section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the Work required to:
   1. Make the several parts fit properly;
   2. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
   3. Remove and replace work not conforming to requirements of the Contract Documents;
   4. Remove and replace defective work.
   5. Fitting of new work to existing work to remain.
   6. Installing underground utilities.
   7. Cutting components to make room for proper installation of new components.
   8. Saw cutting of existing asphalt.

B. Related work:
   1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. In addition to other requirements specified, upon the Architects request uncover work to provide for inspection by the Engineer of covered work, and remove samples of installed materials for testing.
   3. Do not cut or alter work performed under separate contracts without the Engineer's written permission.

1.2 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers 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 section.

1.3 SUBMITTALS:

A. Request for Engineer's consent:
   1. Prior to cutting which effects structural safety, submit written request to the Architect for permission to proceed with cutting.
   2. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Architect and secure his/her written permission and the required Change Order prior to proceeding.

B. Notices to the Architect:
   1. Submit written notice to the Architect designating the time the Work will be uncovered, to provide for the Architects observation.

PART 2 - PRODUCTS:

2.1 MATERIALS:

A. For replacement of items removed, use materials complying with pertinent sections of these specifications.
B. For replacement of concrete, duplicate existing structure in accordance with RIDOT Standard

Specifications for Road and Bridge Construction.

PART 3 - EXECUTION:

3.1 SURFACE CONDITIONS:

A. Inspection:
1. Inspect existing condition, including elements subject to movement or damage during cutting, excavating, patching, and backfilling.
2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:
1. If uncovered conditions are not as anticipated, immediately notify the Engineer and secure needed directions.
2. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION PRIOR TO CUTTING:

A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.3 PERFORMANCE:

A. Perform required excavating and backfilling as required under pertinent other sections of these Specifications.
1. Perform cutting and demolition by methods which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.
2. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.
3. Perform cutting of existing asphalt surfaces in a clean and neat manner by saw cutting. Patch existing asphalt after proper backfill and compacting with hot asphalt, level and smooth to adjacent surfaces.
4. Cut holes in wood materials for installation of mechanical, plumbing and electrical components. Notify Architect of intent to cut wood members before doing so.
5. Patch materials that have been cut with materials that match adjacent materials for smooth and even appearance.

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
   1. Establishing and maintaining lines and levels, and establishing elevations.
   2. Structural design of shores, forms, braces and similar items provided by the Contractor as part of their means and methods of construction.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Additional requirements for field engineering also may be described in other Sections of these specifications.

1.2 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers 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 Section.

1.3 SUBMITTALS:

A. Comply with pertinent provisions of Section 01340.
B. Upon request of the Architect, submit:
   1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
   2. Documentation verifying accuracy of field engineering work.
   3. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or non-conformance with requirements of the Contract Documents.

1.4 PROCEDURES:

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
   1. Locate and protect control points before starting work on the site.
   2. Preserve permanent reference points during progress of the work.

END OF SECTION

SECTION 01152
APPLICATIONS FOR PAYMENT

PART 1 - GENERAL:

1.1 SCHEDULE OF VALUES:

A. Coordinate preparation of the Schedule of Values with the Contractor's Construction Schedule.
B. Correlate line items in the Schedule of Values with other schedules and forms, including:
   1. Application for Payment form.

C. Submit the Schedule of Values to the Architect/Engineer at the earliest date, but no later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.

D. The Schedule of Values is subject to approval of the Architect/Engineer and DEM.

E. Refer to Section 01370 Schedule of Values for specific requirements for the Schedule of Values.

F. The Contract Amount Contains an Owner Controlled Contingency amount that shall be carried as a line item in the Schedule of Values.

1.2 CONTINGENCY ALLOWANCES

A. Use contingency allowance only as directed by Owner and only by Change Orders that indicate amounts to be charged to the allowance.
B. Change Orders authorizing use of funds from the contingency allowance will include Contractor’s related costs and reasonable overhead and profit margins as defined in the Supplemental Conditions.
C. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.3 FORM AND CONTENT:

A. Use the Project Manual Table of Contents as a guide to establish the format.
   1. Identification: Include the following:
      a. Project name and location;
      b. Name of the Architect/Engineer;
      c. Project Number;
      d. Contractor's name and address;
      e. Date of submittal.

B. Arrange the Schedule in tabular form with columns to indicate the following for each item:
   1. Generic name;
   2. Related Specification Section;
   3. Change Orders (No.) that have affected value;
   4. Dollar value.

C. Break Contract Sum down in enough detail to facilitate evaluation of Applications for Payment. Break subcontract amounts down into several line items. Round amounts off to the nearest dollar; the total shall equal the Contract Sum.

D. For each item where an Application for Payment includes products purchased or fabricated and stored, but not installed, provide separate line items for initial cost, each subsequent stage of

completion, and installed value.

E. Each item in the Schedule of Values and Application for Payment shall be complete including total cost and share of overhead and profit.
   1. Temporary facilities and items are not direct cost of Work-in-place may be shown as separate line items or distributed as general overhead expense.

F. Update and resubmit the schedule when Change Orders or Construction Change Directives change the Contract Sum.

G. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

H. Payment Application Times: The date for each progress payment is indicated in the Agreement between the Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

I Application for Payment Forms: **Use AIA Document G702 and AIA Document G703** for Application for Payment.

J. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of the Contractor. Architect will return incomplete applications without action.

1.4 APPLICATIONS FOR PAYMENT:

A. Application Preparation: Complete every entry, including notarization and execution by person authorized to sign on behalf of the Owner. Incomplete applications will be returned without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
   2. Include amounts of approved Change Orders and Construction Change Directives issued prior to the last day of the period covered by the application.
   3. The Contractor is to review Payment items and draft Payment Request with Owner's on-site observer and the Architect/Engineer's field representative before forwarding to the Architect/Engineer.

B. Transmittal: Submit 4 executed signed copies of each application to the Architect/Engineer within twenty-four (24) hours; each copy shall be complete, including waivers of lien and similar attachments.

   Transmit each copy with a transmittal listing attachments, and recording information related to the application.

C. Waivers of Lien: With each application, submit waivers of lien from each entity who may file a lien arising out of the Contract, and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested, prior to deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. Waiver Delays: Submit each application with Contractor's waiver of lien for the period covered by the application.
   4. Submit final Application for Payment with final waivers from every entity involved with performance of Work covered by the application who could be entitled to a lien.
   5. Waiver Forms: Submit lien releases on forms provided by DEM.

6. Owner reserves the right to designate which entities involved in the Work must submit wavers.

1.5 INITIAL APPLICATION FOR PAYMENT:

A. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include:
   1. List of subcontractors;
   2. List of suppliers and fabricators;
   3. Schedule of Values;
   4. Contractor's Construction Schedule
   5. List of Contractor's staff assignments;
   6. Copies of building permits;
   7. Copies of licenses from governing authorities;
   8. Certificates of insurance and insurance polices;
   9. Performance and payment bonds.
   10. Products Lists
   11. Submittal Schedule

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION:

A. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. Administrative actions and submittals that precede or coincide with this application include:
   1. Occupancy permits;
   2. Warranties and maintenance agreements;
   3. Test/adjust/balance records;
   4. Maintenance instructions;
   5. Change-over information related to Owner's occupancy;
   6. Final cleaning;
   7. Application for reduction of retainage, and consent of surety.
   8. Indicate documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

1.7 FINAL PAYMENT APPLICATION:

A. Administrative actions and submittals which must precede or coincide with submittal of the final payment application include:
   1. Completion of Project closeout requirements;
   2. Completion of items specified for completion after Substantial Completion;
   3. Transmittal of required Project construction records to the Owner;
   4. Proof that taxes, fees and similar obligations have been paid.
   5. Final lien release waivers from every entity involved with performance of Work covered by the application who could be entitled to a lien.
   6. AIA Document G706A, “Contractors Affidavit of Release of Liens”.
   7. AIA Document G707, “Consent of Surety to Final Payment”.
   8. Evidence that claims have been settled.
   9. Final meter readings for utilities.

END OF SECTION

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: To enable orderly review during progress of the Work, and to provide for systemic discussion of problems, the Architect will conduct project meetings throughout the construction period.

B. Related Work:

1. Documents affecting work of this section include, but not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. The Contractor's relations with his subcontractors and materials suppliers and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.2 QUALITY ASSURANCE:

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS:

A. Agenda items: To the maximum extent practicable, advise the Architect/ Engineer at least twenty-four (24) hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:

1. The Contractor will compile minutes of each project meeting, and will furnish copies to the Architect and Owner and attendees of the meeting.

2. Contractor shall furnish copies to appropriate people as required to complete project.

3. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS:

(No products are required in this Section)

PART 3 - EXECUTION:

3.1 PROJECT MEETINGS:

A. Attendance:
1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.

2. The Owner's Representative and the Architect’s Representative shall also be in attendance at these meetings.

3. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum agenda:

1. Review, revise as necessary, and approve minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.
3. Identify problems which impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

C. Revisions to minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled project meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

END OF SECTION

SECTION 01340
SUBMITTALS AND SUBSTITUTIONS

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: Make submittals required by the Contract Documents, and revise and resubmit as necessary to establish compliance with the specified requirements.

B. Related Work:
   1. Documents affecting work of this section include, but not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Individual requirements for submittals also may be described in pertinent Sections of these Specifications.

C. Work not included:
   1. Unrequited submittals will not be reviewed by the Architect/Engineer. Unrequired submittals will be returned to the Contactor by the architect without action.
   2. The Contractor may require her/his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and her/his subcontractors and will not be reviewed by the Architect/Engineer.

1.2 QUALITY ASSURANCE:

A. Coordination of submittals:
   1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
   3. The Contractor shall review and coordinate all submittals before submission to the Architect.
   3. By affixing the Contractor's signature to each submittal, certify that the General Contractors coordination and review has been performed.

B. Substitutions:
   1. The Contract is based on the standards of quality established in the Contract Documents. Substitutions will only be considered where indicated in the specific specification section that an “or equal” is allowed.
   2. The following products do not require further approval except for interface within the Work:
      a. Products specified by manufacturer's name and catalog model number.
   3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this Work by the Architect/Engineer.

C. "Or equal":
   1. Where the phrase "or equal," or "or equal as approved by the Architect/Engineer," occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved for this Work by the Architect/Engineer.
   2. The decision of the Architect/Engineer shall be final.

1.3 SUBMITTALS:

A. Make submittals of Shop Drawings, Samples, substitution requests, and other items in accordance with the provisions of this Section.

PART 2 - PRODUCTS:

2.1 SHOP DRAWINGS:

A. Scale and measurements: Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

B. Types of prints required:
   1. Submit Shop Drawings in the form of 2 blackline prints of each sheet.

C. Review comments of the Architect/Engineer will be shown on the prints. The Contractor may make and distribute such copies as are required for her/his purposes.

D. Electronically submitted shop drawings shall not be accepted. Hard printed drawings on paper are required to be submitted.

2.2 MANUFACTURERS' LITERATURE:

A. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents is being submitted for review.

B. Submit the number of copies which are required to be returned, plus one copy which will be retained by the Architect/Engineer.

C. Electronically submitted manufacturers literature shall not be accepted. Hard printed information is required to be submitted.

2.3 SAMPLES:

A. Provide Sample or Samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.

B. Number of Samples required:
   1. Unless otherwise specified, submit Samples in the quantity which is required to be returned, plus one which will be retained by the Architect/Engineer.
   2. By prearrangement in specified cases,a single Sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Architect/Engineer.

PART 3 - EXECUTION:

3.1 IDENTIFICATION OF SUBMITTALS:

A. Consecutively number all submittals.
   1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
   2. On re submittals, cite the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification,

show the submittal number in which the item was included.

D. Maintain an accurate submittal log for the duration of the Work, showing current status of all submittals at all times. Make the submittal log available to the Architect/Engineer for her/his review upon request.

3.2 GROUPING OF SUBMITTALS:

A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
   1. Partial submittals may be rejected as not complying with the provisions of the Contract.
   2. The Contractor may be held liable for delays so occasioned.

3.3 TIMING OF SUBMITTALS:

A. Make submittals far enough in advance for scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and re submittals, and for placing orders and securing delivery.

B. In scheduling, allow at least ten (10) working days for review by the Architect/Engineer following her/his receipt of the submittal. No additional Contract Time will be allowed for the Architects and Engineers review of shop drawings. Schedule submittals to coincide with the work schedule to allow for the Architects/Engineer's review of the most time critical items first.

3.4 Architect/Engineer's REVIEW:

A. Review by the Architect/Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

B Revisions:
   1. Make revisions required by the Architect/Engineer.
   2. If the Contractor considers any required revision to be a change, they shall so notify the Architect/Engineer as provided for in the General Conditions.
   3. Make only those revisions directed or approved by the Architect/Engineer.

C. Reimbursement of Architect/Engineer's costs:
   1. In the event substitutions are proposed to the Architect/Engineer after the Contract has been awarded, the Architect/Engineer will record all time used by them and by their consultants in evaluation of each such proposed substitution. The Contractor shall pay the Architect / Engineer for their time to review proposed substitutions.
   2. Whether or not the Architect/Engineer approves a proposed substitution, the Contractor promptly upon receipt of the Architect/Engineer's billing shall reimburse the Architect/Engineer at the billable rates included in their agreement with the Owners for all time spent by them and all associated reimbursable expenses (ie: printing) in evaluating the proposed substitution.

END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

1.1 DESCRIPTION:

A. Work included: Provide a detailed breakdown of the agreed contract sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. The Contract Amount Contains an Owner Controlled Contingency amount that shall be carried as a line item in the Schedule of Values.

C. Related work:
   1. Documents affecting work of the Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and Section in Division 1 of these Specifications.
   2. Schedule of values is required under the General Conditions.
   3. Schedule of values is required to be compatible with the "continuation sheet" accompanying applications for payment, as described in Section 01152.

1.2 QUALITY ASSURANCE:

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Architect/Engineer, provide copies of the subcontracts or other data acceptable to the Architect/Engineer.

1.3 SUBMITTALS:

A. Prior to first application for payment, submit a proposed schedule of values to the Architect.
   1. Meet with the Architect and determine additional data, if any, required to be submitted.
   2. Secure the Architect's approval of the schedule of values prior to submitting first application for payment.

B. Submit the schedule of values to the Architect for approval at the earliest possible date, but no later than fourteen (14) days before the date scheduled for submittal of initial Applications for Payment.

1.4 COORDINATION:

A. Coordinate preparation of the schedule of values with preparation of Contractors construction schedule.
   a. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
      i. Application for Payment forms with continuation sheets.
      ii. Submittal schedule.
      iii. Items required to be indicated as separate activities in Contractors construction schedule.

1.5 FORMAT AND CONTENT:

A. Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section and in further detail as required for different materials specified in the same section, and as directed by the Architect.

Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts.

B. Identification: Include the following Project identification on the schedule of values:

1. Project name and location.
2. Name of Architectural firm.
3. Contractors name and address.
4. Date of submittal.

C. Arrange schedule of values consistent with format of AIA Document G703.

D. Include separate line items under Contractor and principal subcontractors for LEED documentations and other project closeout requirements in an amount totaling five (5) percent of the Contract Sum and subcontract amount.

E. Round to the nearest whole dollar; total shall equal the Contract Sum.

F. Provide separate line items in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

G. Provide separate line item for General Conditions, Overhead and Profit.

H. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES

1.1 RELATED DOCUMENTS:

The General Conditions and applicable portions of Division 1 of the specifications are a part of this section, which shall consist of all labor, equipment and materials necessary to complete all work indicated on the Contract Documents. Comply with all OSHA codes for all temporary facilities. Provide all necessary temporary facilities required to perform the work including but not limited to items specifically called for in this section.

1.2 ACCESS:

A. Block public access to the site for the prosecution of the work. Enclose work area with the minimum of a 8 foot high chain link fence. Relocate fence as required to accommodate public beach access, Owner requirements.

B. Provide all necessary scaffolding, platforms, ladders, ramps, chutes, temporary stairs, and all other access items. Maintain in a safe condition throughout the construction process.

1.3 HOISTING FACILITIES:

A. Provide hoisting facilities as required for the vertical movement of all materials.

B. Comply with OSHA and other governing codes for all hoists, conveyors, and elevators and maintain the facilities in compliance with the law.

1.4 GUARDRAILS, DECK AND OTHER OPENINGS:

A. Provide guardrails, barricades, handrails, and covers for decks, and other openings.
B. Comply with OSHA and other governing codes

1.5 TRASH:

A. Provide sufficient trash receptacles.

B. Collect and deposit debris in such collection facilities.

C. Remove all debris from the job site on a regular basis. Do not allow trash and debris to accumulate or remain on site for longer than 48 hours.

E. Keep the construction work areas free of construction waste. Clean up the construction area as needed and at a minimum on a daily basis.

1.6 SANITATION FACILITIES:

A. Provide adequate temporary toilet facilities. Construction personnel shall not be permitted to use the existing bathhouse toilet facilities.

B. Maintain such facilities in a clean sanitary condition.

1.7 WEATHER PROTECTION AND TEMPORARY HEAT/VENTILATION:

A. During construction, provide weather protection and temporary heat when required. Please note temporary heat will be required for concrete repair of the existing beams that are damaged.

1.8 OTHER TEMPORARY FACILITIES AND CONTROLS:

A. Protection of Work-In-Place:
   1. Thoroughly protect all completed work and all stored materials.
   2. Provide boards, cloths, planks, waterproof paper, canvas or other approved protection and use as necessary to prevent any damage.
   3. Replace or rectify work or materials damaged by workers, by the elements or by any other cause, to the satisfaction of the Architect/Engineer and at no additional expense to the Owner.
   4. Do not allow workers, including those of any subcontractor or supplier to mark finish surfaces with marking pens or other such devices which are not readily erasable.

C. Special Openings:
   1. Early in the work, confer with all parties providing apparatus of various kinds. Should any be of a size and character than cannot properly be taken into the indicated position through openings shown, make necessary arrangements for the installation of such items in a manner satisfactory to those providing them and to the Owner. Make good any damage that may be caused thereby.

C. Field or Construction Office:

   1. Contractor may, as part of their means and methods for executing the work, have a field office trailer for the Contractors sole use. Location of trailer shall be coordinated with the Owner and may need to be relocated during construction as needed. Contractor field office shall be a separate and independent structure from the trailer dedicated for Owners Representative.
   2. Coordinate the trailer locations with the Owner's Representative. Provide temporary exterior lighting. Maintain the field office in a clean condition.
   3. Pay for all utility costs INCLUDING National Grid utilities.

E. Other signs: Provide temporary signs as required informing the public of areas that are only accessible to construction personal. Provide signs informing the public where public parking is available and where beach access is available during construction operations.

1.9 REMOVAL OF TEMPORARY FACILITIES:

A. Remove all items indicated above and other construction of a temporary nature from the site as soon as the progress of the work will permit.

B. Recondition the portions of the site so occupied and restore to conditions acceptable to the Architect/Engineer.

1.10 ENTRANCE BOOTH ELECTRIC POWER:

A. Electric power to the two entrance booths must be provided at all times during construction.

1.11 CLEAN UP

A. Clean entire construction site before Owner Occupancy. Remove all construction waste. Clean

all interior and exterior surfaces.

a. Mop all interior floors.
b. Remove all construction marks, pencil marks, chalk lines layout lines, footprints, scuff marks, etc.
c. Remove all construction dust, including sawdust.
d. Remove all construction waste from below the first floor deck and throughout the project site including demolition left over materials, trash, scrap lumber, nails, screws, fasteners, hangers etc. The underside of the deck shall be free of all possible hazards to the public from construction materials.

END OF SECTION

SECTION 01640
PRODUCT HANDLING

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.
   2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE:

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS:

A. Except as otherwise approved by the Architect/Engineer, determine and comply with manufactures' recommendations on product handling, storage, and protection.

1.4 PACKAGING:

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items for the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Architect/Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Architect/Engineer as to manufacturer, grade quality, and other pertinent information.

1.5 PROTECTION:

A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.
B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.
C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.
D. Protect materials from damage that may be caused by weather including high tides, wind, rain, snow and ice.

1.6 REPAIRS AND REPLACEMENTS:

A. In the event of damage, promptly made replacements and repairs to the approval of the Architect/Engineer and at no additional cost to the Owner.
B. Additional time required to secure replacements and to make repairs will not be considered by the Architect/Engineer to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01699
FINAL CLEANING

1.1 DESCRIPTION:

A. Work included: Final Cleaning.
B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE:

A. Prior to final cleaning verify that all work has been completed in accordance with the Contract Documents. Begin cleaning only after all work is complete that may generate need for cleaning.
B. Retain services of a cleaning company to perform cleaning as part of the final cleaning contract work.

1.3 PROCEDURES:

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
   1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
      a. Clean Project site, yard and grounds in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Clean the interior of all ductwork. Remove all construction debris and accumulated dust from the interior of all ducts, registers and grills. Duct cleaning shall occur only after all dust generating 'punch list' items have been corrected. Subcontract a professional duct cleaning company to perform this work.
      c. Vacuum all floor surfaces.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Dust all horizontal surfaces including edges of trim.
      f. Clean exposed exterior and interior hard-surfaced finishes to a dirt free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
      g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, manholes, attics and similar spaces.
      h. Clean transparent materials, including mirrors and glass in doors and windows, interior and exterior. Remove glazing compounds and other noticeable, vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish stainless steel mirrors. Polish glass, taking care not to scratch surfaces.
      i. Remove labels that are not permanent.
      j. Touch up and otherwise repair and restore marred, exposed finishes and

surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint drippings, and other foreign substances.

l. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

n. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent fixtures to comply with requirements for new fixtures.

p. Leave project clean and ready for occupancy.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

1.1 DESCRIPTION:

A. Work included: Provide an orderly and efficient transfer of the completed Work to the Owner.
B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. "Substantial Completion" is defined in the General Conditions.

1.2 QUALITY ASSURANCE:

A. Prior to requesting inspection by the Architect/Engineer, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.

1.3 PROCEDURES:

A. Substantial Completion:
   1. Prepare and submit the punch list required by the General Conditions.
   2. Within a reasonable time after receipt of the list, the Architect/Engineer will inspect or determine status of completion.
   3. Should the Architect/Engineer determine that the Work is not substantially complete:
      a. The Architect/Engineer promptly will so notify the Contractor, in writing, giving the reasons therefore.
      b. Remedy the deficiencies and notify the Architect/Engineer when ready for Architect field review.
      c. The Architect/Engineer will review the Work.
   4. When the Architect/Engineer concurs that the Work is substantially complete:
      a. The Architect/Engineer will prepare a "Certificate of Substantial Completion" on AIA form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified by the Architect/Engineer.
      b. The Architect/Engineer will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

B. Final Completion:
   1. Prepare and submit the notice required by the General Conditions.
   2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in the General Conditions.
   3. Certify that:
      a. Contract Documents have been reviewed;
      b. Work has been inspected for compliance with the Contract Documents;
      c. Work has been completed in accordance with the Contract Documents;
      d. Equipment and systems have been tested as required, and are operational;
      e. Work is completed and ready for final review.
   4. The Architect/Engineer will make a field visit to verify status of completion.
   5. Should the Architect/Engineer determine that the Work is incomplete or defective:
      a. The Architect/Engineer promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
      b. Remedy the deficiencies promptly, and notify the Architect/Engineer when ready for Architect field review.

6. When the Architect/Engineer determines that the Work is acceptable under the Contract Documents, she/he will request the Contractor to make closeout submittals.

C. Closeout submittals include, but are not necessarily limited to:
1. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications, and for other items when so directed by the Architect/Engineer;
2. Warranties and bonds;
3. Keys and keying schedule;
4. Spare parts and materials extra stock.
5. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
   a. Certificates of Inspection;
   b. Certificates of Occupancy;
6. Certificates of Insurance for products and completed operations;
7. Evidence of payment and release of liens;
8. List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.
9. Project Record Documents.

D. Final adjustment of accounts:
1. Submit a final statement of accounting to the Architect/Engineer, showing all adjustments to the Contract Sum.
2. If so required, the Architect/Engineer will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

1.4 INSTRUCTION:

A. Instruct the Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work.

1.5 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations. Refer to Section 01500 Temporary Facilities for additional cleaning requirements during and after construction. Refer to Section 01699 Final Cleaning for more specific requirements.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer’s written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   a. Clean Project site, yard and grounds in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface. Include area under elevated deck. Remove all nails, screws, fasteners from under elevated deck and ramps.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Clean exposed exterior and interior hard-surfaced finishes to a dirt free

condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
g. Sweep concrete floors broom clean.
h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish stainless steel mirrors. Polish glass, taking care not to scratch surfaces.
i. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    i. DO NOT PAINT OVER “UL” LABELS AND OTHER REQUIRED LABELS AND IDENTIFICATION, INCLUDING MECHANCAL AND ELECTRICAL NAMEPLATES.
k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint drippings, and other foreign substances.
l. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean all wall louvers.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
q. Leave project clean and ready for occupancy.
r. Sweep, vacuum and mop all epoxy coated floor surface, all radial rubber stair and floor surfaces.

END OF SECTION

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included:
   1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.
   2. Upon completion of the Work, transfer the recorded changes to a set of Record Documents, as described in Article 3.2 below.
   3. Record Drawings.
   4. Record Specifications.
   5. Record Product Data.
   6. Miscellaneous record submittals.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE:

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractors's staff as approved by the Architect/Engineer.

B. Accuracy of records:
   1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of the Specification and each sheet of the ;Drawings and other Documents where such entry is required to show the change properly.
   2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained form the approved Project Record Documents.

C. Make entries within twenty-four (24) hours after receipt of information that the change has occurred.

1.3 SUBMITTALS:

A. Comply with pertinent provisions of Section 01340.

B. Record Drawings, submit one set of marked up record prints.

C. Record Specifications, submit one paper copy of Project’s Specifications, including addenda and contract modifications.

D. Record Product Data, submit one paper copy of each submittal.

E. Miscellaneous Record Submittals: Refer to the Specification Sections for miscellaneous record keeping requirements and submittals in connection with various construction activities. Submit

one paper copy of each submittal.

F. The Architect/Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Architect/Engineer's approval of requests for progress payment and request for final payment under the Contract.

G. Prior to submitting each request for progress payment, secure the Architect/Engineer's approval of the current status of the Project Record Documents.

H. Prior to submitting request for final payment, submit the final Project Record Documents to the Architect/Engineer and secure his approval.

1.4 PRODUCT HANDLING:

A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.

B. In the event of loss of recorded data, use means necessary to again secure the data to the Architect/Engineer's approval.
   1. Such means shall include, if necessary in the opinion of the Architect/Engineer, removal and replacement of concealing materials.
   2. In such case, provide replacements to the standards originally required by the Contract Documents.

PART 2 - PRODUCTS:

2.1 RECORD DOCUMENTS:

A. Record Prints: Maintain one set of marked up paper copies of the Contract Drawings and Shop Drawings.

   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawings technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding archive photographic documentation.
   2. Content: Types of items requiring markings include, but are not limited to, the following:
      a. Dimensional changes to the drawings.
      b. Revisions to details shown on the drawings.
      c. Depths of foundations and piles below grade.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Clivus vent pipe locations.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Change Directive.

k. Details not on the original Contract Documents.
l. Field records for variable and concealed conditions.
m. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda and contract modifications. Include reference to bulletins or Change Orders and their respective numbers.

2.3 RECORD PRODUCT DATA

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

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION:

3.1 MAINTENANCE OF JOB SET:

A. Immediately upon receipt of the job set described in Paragraph 2.1-A above, identify each of the Documents with the title, **"RECORD DOCUMENTS - JOB SET."**

B. Preservation:
1. considering the Contract completion time, the probable number of occasions upon the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect/Engineer.
2. Do not use the job set for any purpose except entry of new data and for review by the Architect/Engineer, until start of transfer to date to final Project Record Documents.
3. Maintain the job set at the site of Work as that site is designated by the by the Architect/Engineer.

C. Making entries on Drawings:
1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
2. Date all entries.
3. Call attention to the entry by a **"cloud"** drawn around the area or areas affected.
4. In the event of overlapping changes, use different colors for the overlapping changes.

D. Make entries in the pertinent other Documents as approved by the Architect/Engineer.

E. Conversion of Schematic Layouts:
   1. In some cased on the Drawings, arrangements of conduits, piping, ducts and similar items, is shown schematically and is not intended to portray precise layout.
      a. Final physical arrangement is determined by the Contractor, subject to the Architect/Engineer's approval.
      b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.

   2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in subparagraph 3.1-E-1 above.
      a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
      b. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," and the like).
      c. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

F. Recording: Maintain one copy of each submittal during the construction period for project record purposes. Post changes and modifications to project record documents as they occur, do not wait until the end of the project.

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

H. Review and Submittal:
   1. Submit the completed set of Project Record Documents to the Architect/Engineer as described in Paragraph 1.3 above.
   2. Participate in review meetings as required.
   3. Make required changes and promptly deliver the final Project Record Documents to the Architect/Engineer.

3.2 CHANGES SUBSEQUENT TO ACCEPTANCE:

A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

END OF SECTION

SECTION 01730
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work included: To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE:

A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

1.3 SUBMITTALS:

A. Comply with pertinent provisions of Section 01340.

B. Submit two copies of a preliminary draft of the proposed Manual or Manuals to the Architect/Engineer for review and comments.

C. Unless otherwise directed in other Sections, or in writing by the Architect/Engineer, submit three copies of the final Manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS:

2.1 INSTRUCTION MANUALS:

A. Prepare instruction manuals in accordance with the provisions of this Section.

B. Contents: Include at least the following:
   1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.
   2. Complete instructions regarding operation and maintenance of all equipment involved.
   3. Complete nomenclature of all parts of all equipment.
   4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
   5. Copy of all guarantees and warranties issued.
   6. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
   7. Such other data as required in pertinent Sections of these Specifications.

PART 3 - EXECUTION:

3.1 INSTRUCTION MANUALS:

A. Preliminary:
   1. Prepare a preliminary draft of each proposed Manual
   2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.
   3. Secure the Architect/Engineer's approvals prior to proceeding.

B. Final:
   1. Complete the Manuals in strictly accordance with the approved preliminary drafts and the Architect/Engineer's review comments.

C. Revisions:
   1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Architect/Engineer.

END OF SECTION

SECTION 02050
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Selective Demolition:

1. Selective demolition of components of the existing building.
2. Removal of hollow items or items which could collapse.
3. Protection of site work and adjacent structures.
4. Disconnection, capping, and removal of utilities.
5. Pollution control during building demolition, including noise control.
6. Removal and legal disposal of materials.
7. Selective demolition of existing components as required to perform the work.

1.02 SUBMITTALS

A. None required.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Use experienced workers.

1.04 PROJECT CONDITIONS

A. Immediate areas of work will not be occupied during selective demolition. Adjacent areas may be occupied by the public, including children.

PART 2 - PRODUCTS - Not Applicable To This Section

PART 3 - EXECUTION

3.01 SELECTIVE DEMOLITION

A. Do not damage site elements and improvements to remain.

B. Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

C. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.

D. Provide adequate protection against accidental trespassing. Secure project after work hours.

E. Prevent damage to existing improvements indicated to remain, including improvements on and off site.

F. Remove abandoned mechanical and electrical work.

G. Control windblown sand.

H. Remove waste materials and unsuitable soil from site and dispose of in a legal manner.

I. Do not allow demolished materials to fall into the sand. Remove and legally dispose of any materials, material scraps and construction waste that falls into the sand during selective demolition construction.

J. Repair any damage to the building of existing items to remain that were damaged during selective demolition.

3.02 SCHEDULE

A. Items for Protection During Demolition and Construction:

1. Asphalt paving not affected by the work
2. Site improvements including, fencing, curbs, guards, walls, stairs, guardrails, handrails, concrete and steel bulkhead etc. not affected by the work.
3. Existing road surfaces.
4. Adjacent lots electrical service that runs through the project property.
5. Existing building components to remain.
6. The existing concrete beams and support piles.
7. The existing lattice panels below the building.
8. The existing buildings not as part of the work.
9. The existing elevated deck, posts and rails.
10. Existing decking and guard railings.
11. Any existing building component to remain.
12. Any portion of the existing elevated deck.

END OF SECTION

SECTION 02160
SHORING AND BRACING

PART 1 - GENERAL

1.01 SUMMARY

A. Shore and brace sidewalls in deep excavations with OSHA approved methods of steel sheet, soldier piles or timber lagging or other OSHA approved methods as required to protect existing buildings, utilities, roadways, and improvements and to prevent cave-ins, loss of ground, or damage to people and property.

B. Provide survey and engineering services required for shoring and bracing.

C. Maintain shoring and bracing during construction activities, and remove shoring and bracing if practical when construction and filling is complete.

D. All shoring and Bracing to be in compliance with all OSHA regulations and codes.

1.02 SUBMITTALS

A. Layout of shoring and bracing and other data, acceptable to local authorities having jurisdiction, prepared by a qualified professional engineer.

1.03 QUALITY ASSURANCE

A. Survey of Adjacent Structures and Levels: Registered land surveyor prior to excavation.

B. Engineer: A professional engineer licensed in the jurisdiction of the project.

C. Comply with codes and ordinances of governing authorities having jurisdiction. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet steel: Heavy-gauge steel sheet suitable for service.

B. Soldier piles: Steel H-beams in serviceable condition.

C. Timber lagging: Heavy timber pressure treated with wood preservative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in proper relation with adjacent construction to permit forming and finishing of concrete surfaces. Coordinate with work of other sections.

B. Locate shoring and bracing to avoid permanent construction. Anchor and brace to prevent collapse.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 Scope: furnish all labor, materials, equipment and incidentals to complete all concrete reinforcement indicated on the drawings, specified herein, or both.

1.02 Work included in this Section: the work includes, but is not necessarily limited to the following items:

A. Reinforcing steel bars and welded steel wire fabric for cast-in-place concrete slabs, pan joist system, stairs, ramps and concrete paving; complete with tie wire and accessories.

B. Bar supports and spacers for reinforcing.

C. Reinforcing steel bars and ties for site insertion into Precast Concrete work.

1.03 RELATED WORK:

A. Specification sections:

1. 03250: Concrete General
2. 02367: Prestresses Concrete Piles

1.04 QUALITY ASSURANCE

A. Perform concrete reinforcing work in accordance with CRSI Manual of Standard Practice, unless specified otherwise in this section.

1.05 REFERENCE STANDARDS

A. ACI 315 - Manual of Standard Practice.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. AWS D12.1 - Welded Reinforcing Steel, metal Inserts and Connections in Reinforced Concrete Construction.

F. CRSI - Manual of Standard Practice.

1.06 SHOP DRAWINGS

A. Submit in accordance with provisions of Section 01300.

B. Indicate bar sizes, spacings, locations and quantities of reinforcing steel and wire fabric, bending and cutting schedules and supporting and spacing devices.

C. Comply with detailing standards in ACI 315.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle in accordance with provisions of Section 01600.

B. Deliver reinforcement to the project site bundled, tagged and marked.

C. Use metal tags indicating bar size, lengths and other information corresponding to markings shown on placement diagrams.

1.08 SUBMITTALS

A. Submit the LEED Materials Submittal Form found in Section 01012, listing each product for the following (Refer to Section 01011, LEED Certification Requirements for additional information):

1. Recycled Content: Obtain recycled content information and submit to architect.
   a. Record manufacturers name, product cost, percentage of postconsumer content, and percentage of preconsumer content.
   b. Collect cutsheets or manufacturers letters that document the products recycled content.

2. Regional Materials: Obtain regional material information and submit to architect.
   a. Record manufacturers name, product cost, distance between the project and manufacturer, and distance between project and the extraction site.
   b. Collect cutsheets or manufacturers letters that document material origin and manufacturer are within a 500-mile radius of the project site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars; ASTM A-767, Grade 60. Galvanized.

B. Welded Wire Fabric (WWF): ASTM A-185.

C. Supports for Reinforcement:

1. Bolsters, spacers and other devices for spacing, supporting and fastening reinforcement in place.
2. Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated.

2.02 FABRICATION

A. General: fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice". In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.

B. Unacceptable Materials: reinforcement with any of the following defects will not be permitted in the work.

1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
2. Bends or kinks not indicated on drawings or final shop drawings.
3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with the specified codes and standards, and CRSI recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports and as herein specified.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

C. Position, support and secure reinforcement against displacement by formwork construction or concrete placement operations. Locate and support reinforcing by runners and spacers as required.

D. Place reinforcement to obtain the minimum coverage for concrete protection. Arrange, space and securely tie bars and supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with 16 wire. Offset end laps in adjacent widths to prevent continuous laps.

F. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

G. Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wire tying. Complying with requirements of ACI 318 for minimum lap of spliced bars.

END OF SECTION 03200

SECTION 03250
CONCRETE GENERAL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. General criteria for materials, mixes and evaluations of concrete as required for other related sections of these specifications.

1.02 QUALITY ASSURANCE

A. Perform preparation of concrete material in accordance with ACI 304, unless specified otherwise in this section.

1.03 REFERENCE STANDARDS

A. Concrete:

1. ACI 301: Structural Concrete Buildings
2. ACI 304: Measuring, Mixing, Transporting and Placing Concrete
3. ACI 613: Selecting Proportions for Concrete
4. ASTM C33: Concrete Aggregates
5. ASTM C94: Ready-Mixed Concrete
6. ASTM C150: Portland Cement
7. ASTM C260: Air-Entraining Admixtures for Concrete
8. ASTM C494: Chemical Admixtures for Concrete
9. ASTM C618: Fly Ash - for use in Portland Cement Concrete

B. Testing:

1. ACI 318: Building Code Requirements for Reinforced Concrete
2. ASTM C31: Making and Curing Concrete Test Specimens in the field
3. ASTM C39: Test for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C42: Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5. ASTM C94: See above
6. ASTM C143: Test for Slump of Portland Cement Concrete
7. ASTM C172: Sampling Fresh Concrete
8. ASTM C231: Test for Air Concrete of Freshly Mixed Concrete by the Pressure method

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C-150, as follows:

1. Provide Type I cement,

B. Aggregates: ASTM C-33, and as herein specified:

1. Find Aggregate: clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
2. Coarse Aggregate: clean, uncoated, processed aggregate containing:
   a. Crushed stone, processed from natural rock or stone.
   b. Washed gravel, either natural or crushed. Use of pit or bank run gravel is not permitted.

c. Size range: 3/4" maximum, 1/4" minimum.

C. Water: clean, fresh, drinkable.

2.02 CONCRETE ADMIXTURES

A. Provide admixtures produced by established reputable manufacturers and use in compliance with the manufacturer's printed directions. Do not use admixtures which have not been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by the Architect.

1. Air-entrained Admixtures: ASTM C-260.
2. Water-reducing Admixtures: ASTM C-494, Type A.
3. Fly Ash : ASTM C-618, Class F.

B. Plasticizer: Daracem 100 - 8 to 10 oz. per 100 lbs of cement (Daracem as manufactured by W. R. Grace) or approved equal, conforming to ASTM C-404, types A, F, and G.

C. Corrosion Protection: DCI (Calcium Nitrate) - 2 lbs. per cubic yard of concrete, (DCI as manufactured by W. R. Grace) or approved equal, conforming to ASTM C-404, type C.

2.03 CONCRETE REPAIR PRODUCTS

A. SikaTop 123 Plus Two-component polymer-modified, cementitious, non-sag mortar
B. Sika Ferrogard-901 corrosion inhibiting concrete admixture

PART 3 - EXECUTION

3.01 PROPORTIONING AND DESIGN OF MIXES

A. Prepare mixes for concrete - 4000 psi at 28 days

B. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project, complying with ACI 613

C. Field Experience Method: When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301.

D. Admixtures: Use air-entraining admixtures in exterior exposed concrete, unless otherwise shown on specified. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the following limits:

E. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement as follows:

1. Not less than 1" and not more than 3".

3.02 CONCRETE MIXING

A. General: concrete may be mixed at batch plants or it may be transit-mixed as specified herein. batch plants must comply with the requirements of ACI 304, with sufficient capacity to produce concrete of the qualities specified in quantities required to meet the construction schedule.

B. Ready-Mix Concrete: comply with the requirements of ASTM C-92, and as herein specified, provided the quantity and rate of delivery will permit unrestricted progress of the

work in accordance with the placement schedule. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C-94 may be required.

C. Concrete Repair Mortar: Mix in conformance with all manufacturer's requirements, as specified on product packaging, Product Data sheets or otherwise. Any questions regarding mixing and proportioning must be directed to the manufacturer.

3.03 FIELD QUALITY CONTROL

A. Strength of Concrete Structures: the strength of the concrete structure in-place will be considered potentially deficient if it fails to comply with any of the requirements which control the strength of the structure, including the following conditions:

1. Failure to meet compressive strength test requirements.
2. Poor workmanship and quality control likely to result in deficient strength.

B. Defective Work: concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected at the Contractor's expense, without extension of time therefor. The Contractor shall also be responsible for the coat of corrections to any other work affected by or resulting from corrections to the concrete work.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide the following:

1. Rough hardware.
2. Loose bearing and leveling plates.
3. Miscellaneous metal trim.
4. Floor plate and supports.
5. Steel plates and bolts.
6. Steel plates at truss connections.

B. All fasteners and plates shall be stainless steel, type 316 for marine exposure.

C. All metal utility hangers and supports shall be stainless steel including fasteners.

D. Any threaded rods used on the project shall be stainless steel, type 316 for marine exposure.

1.02 SUBMITTALS

A. Submit for approval, shop drawings of all fabricated connection plates.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

B. Stainless Steel Materials:

1. Bar Stock: ASTM A 276, Type 316.
2. Plate: ASTM A 666, Type 316.

D. Fasteners:

1. Bolts and Nuts: Stainless steel, type 316.
2. Lag Bolts: Square head, Stainless steel, type 316.
3. Machine Screws: Stainless Steel, type 316.
4. Wood Screws: Stainless steel, type 316.
5. Plain Washers: Stainless steel, type 316.
8. Lock Washers: Stainless steel, type 316.

E. Auxiliary Materials:

1. Nonshrink Nonmetallic Grout: CE CRD-C621.
2. Exterior/Interior Anchoring Cement: Erosion-resistant hydraulic expansion cement.

3. Shop Primer: Alkyd primer, FS TT-P-645.
5. Bituminous Paint: Asphalt mastic, SSPC - Paint 12.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Take field measurements prior to preparation of shop drawings and fabrication. Do not delay job; allow for cutting and fitting if field measurement not practical.

B. Form work true to line with sharp angles and edges. Weld continuously, grind flush and make smooth on exposed surfaces.

C. Install work plumb and level with hairline joints and ground flush welds.

D. Lintels: Provide sizes indicated with 8" bearing at each end.

E. Touch-up damaged coatings with shop primer and galvanize repair paint.

F. Paint items scheduled in accordance with painting section.

G. Isolate dissimilar metals.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1- GENERAL

1.01 WORK INCLUDED

A. Plates, studs, headers, joists, beams, rafters and blocking within the buildings setting on the concrete platform, as indicated on the drawings, plus accessories and hardware standard with light framing.

B. All structural framing, and general dimensional framing, flooring, sub-flooring, plywood, wood doors and finishes shall be FSC Certified.

C. All composite wood, such as MDF, plywood, particleboard, panel substrates and door cores, used on the interior of the building (i.e., inside of the weatherproofing system and applied on-site) must contain no added urea-formaldehyde resins.

1.02 DESCRIPTION

A. Related work specified elsewhere:
   1. Forms: section 03100
   2. Wood Decking: section 06125
   6. Laminated Veneer Lumber: section 06172
   4. Plybead: Section 06180
   7. Interior Architectural Woodwork: section 06402
   6. Exterior Architectural Woodwork: section 06401
   7. Decking: section 06680
   8. Wood Stains: section 09931

1.03 QUALITY ASSURANCE

A. Lumber Grading Rules and Wood Species to be in conformance with PS 20.

B. Grading rules of following associations apply to materials furnished under this section:
   1. Southern Pine Inspection Bureau (SPIB).
   2. West Coast Lumber Inspection Bureau (WCLIB).
   3. Western Wood Products Association (WWPA).

C. Plywood Grading Rules:
   1. Softwood Plywood - construction and industrial: PS 1.

D. Grade Marks:
   1. Identify lumber and plywood by official grade mark.
   2. Lumber:
      a. Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded where applicable and condition of seasoning at time of manufacturer.
      b. S-Dry: maximum 19% moisture content.
      c. MC-15 or KD: maximum of 15% moisture content.
   3. Softwood Plywood:
      a. Conforming PS 1.

E. Testing:
   1. ASTM E84, maximum 25 flame spread rating.

F. Requirements of Regulatory Agencies:
   1. Fire hazard classification: Underwriter's Laboratories, Inc., for treated lumber and plywood.
   2. Preservative treated lumber and plywood: American Wood Preservers Bureau, Quality Mark.
   3. Pressure treated material: American Wood Preservers Bureau Standards.
   4. Working stresses: National Design Specifications, National Forest Products Association.

G. Reference Standards:
   1. American Society for Testing and Materials (ASTM):
      a. ASTM A 526, steel, sheet, zinc coated (galvanized) by the Hot-Dip process, general requirements.
      b. ASTM D 226, asphalt saturated organic roofing felt for use in membrane waterproofing and build up roofing.
   2. American Wood Preservers Association (AWPA):
      a. C20, structural lumber, fire retardant treatment by pressure processes.
      b. C27, plywood fire retardant treatment by pressure processes.
   3. American Wood Preservers Bureau (AWPB):
      a. AWPB LP-2, standard for softwood lumber, timber and plywood pressure treated with water-borne preservatives for above ground use.
      b. AWPB LP-3, standard for softwood lumber, timber and plywood pressure treated with light petroleum Solven Penta solution for above ground use.
      c. AWPB LP-22, standard for softwood lumber, timber and plywood pressure treated with water borne preservatives for ground contact use.
   4. National Forest Products Association (NFPA):
      a. National Design Specifications for Wood Construction.
      b. Wood Structural Design Data.
   5. Products standards (PS):
      a. PS 20, American Softwood Lumber Standard.
      b. PS 56, Structural Glued Laminated Timber.
   6. Southern Pine Inspection bureau (SPIB):
      a. Standard Grading Rules for southern pine lumber.
   7. Western Wood Products Association (WWPA):
      a. Standard Grading Rules for Western Lumber.

1.04 SUBMITTALS

A. Certification: provide certifications for pressure treated wood, fire retardant treated wood and preservative treated wood indicated conformance with applicable standards.

1.05 PRODUCT HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather and high humidity.

1.06 JOB CONDITIONS

A. Time delivery and installation of wood materials to avoid extended on site storage and avoid delaying work of other trades.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber:
   1. Dimensions: specified lumber dimensions are nominal; actual dimensions to conform to PS 20.
   2. Surfacing: surface four sides (S4S), unless specified otherwise.
   3. End jointed lumber: structural purposes interchangeable with solid sawn lumber; glued joints of load bearing lumber to conform to PS 56.
   4. Framing lumber, any commercial softwood species:
      a. General blocking and bracing (concealed from view): Southern Yellow Pine #2 MD and better.
      b. Refer to structural plan notes for framing lumber requirements

B. Plywood:
   1. Exterior graded plywood throughout.
   2. Wall Sheathing: A-C grade APA rated.
   3. Subfloor sheathing: C-C grade APA rated, Sturd-I-Floor Ext-APA, pressure treated. Note Subfloor pressure treatment may be special order.
   4. Underlayment: Exterior grade, Underlayment C-C Plugged Ext-APA.

C. Building Paper: asphalt saturated felt, ASTM D 226, 15 lb. for walls and 30 lb. for roofs, non perforated. Tyvek or similar materials shall not be used.

E. Preservative Treated Wood Products:
   1. Water-borne preservatives for painted, stained or exposed natural wood product; AWPB LP-2 for above ground application and AWPB LP-22 for ground contact application.
   2. Oil borne preservatives for any construction except when in contact with salt water: AWPB LP-33.

F. Rough Hardware:
   1. Bolts, nuts, washers, lag screws, screws and expansion shields: standard units, stainless steel, sized as required or shown. Where stainless steel hardware is connected with bolts, nuts, washers, lag screws, screws etc, use type 316 stainless. Where fasteners penetrate into pressure treated lumber, use type 316 stainless steel fasteners.
   2. Nails and Staples: standard size, type and gauge for application, stainless steel. Where stainless steel hardware is connected with nails, use stainless steel nails, type 316 stainless. Where fasteners penetrate into pressure treated lumber, use type 316 stainless steel fasteners.
   3. Joist Hangers: Stainless steel Sheet: ASTM A 666, type 316. Custom order where necessary.
   4. Bar or strap anchors: Stainless steel, ASTM A 666, type 316. Custom order where necessary.

G. Adhesives for Field Gluing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

H. Timber roof rafter members:
   1. Nominal 3” and 4” thickness members, match truss species and grade

2.02 MOISTURE CONTENT:

A. Except as otherwise indicated, provide lumber of 19 percent or similar indication in grade markings or certification of grade.

PART 3- EXECUTION

3.01 INSPECTION

A. Verify that surfaces to receive rough carpentry materials are prepared to required elevations and dimensions.

3.02 INSTALLATION

A. Sills: set level on deck and secure with anchor bolts or devices as detailed and at spacing indicated on the drawings. If not indicated, use 1/2" dia. anchor bolts at a maximum of 2'-0" on centers into concrete. Sills to be double layer 2" pressure treated lumber with lapped joints.

B. Posts or Columns: provide two surfaces on posts at right angle to each other for installation of interior finish materials. Erect posts straight and plumb.

C. Stud Framing:
   1. Plates and stud members: single bottom plate and double top plate, studs in continuous lengths without splices, nailed to conform to industry standards.
   2. Headers: continuous headers sized as indicated on drawings or required for opening.

D. Beams and Girders:
   1. Install with crown edge up. Provide minimum 4" bearing at ends.
   2. Beams or girders framed into pockets of exterior concrete or masonry walls, provide minimum of 1 inch air space between sides and ends of wood members and concrete or masonry wall.

E. Plywood Sheathing:
   1. Lay plywood with face grain perpendicular to supports, using panel with continuous end joints over two or more spans staggered between panels and locate over supports. Nail at each support with 6d nails (or equivalent staples) spaced 6" on centers at ends and 8" on center at other supports. Drive nails to full penetration.
   2. Allow minimum 1/16" space between end joints and 1/8" at edge joints for expansion and contraction of panels.

F. Pressure Treated Wood Products:
   1. Provide pressure treated wood for all framing, blocking, furring, nailing strips built into exterior walls, and wood in contact with concrete.
   2. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

G. Underlayment nailing schedule:
   1. 4d stainless steel nails ring shanked nails, 6” spacing along panel edges and 8” spacing each way in panel interior. Counter sink nail heads below surface of the underlayment just prior to installing finished floor. Fill and sand joints in panels.

H. Building Paper application: Apply building paper horizontally with 2-inch wide minimum overlap and 6-inch end overlap. Fasten to sheathing with galvanized staples or galvanized roofing nails. Apply to shed water over joints.

END OF SECTION 06100

SECTION 06125
ROOF WOOD DECKING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The extent of wood decking (Wd-Dk) is shown on the drawings, by drawing symbols as indicated and by the terminology used in this specification or by abbreviations as indicated.

B. Wood decking is hereby defined to include solid and laminated wood deck members with thickness exceeding 1" (nominal), excluding plywood and decking units of recomposed wood products.

C. The types of wood decking specified in this section include the following: solid wood planking, unmatched.

1.02 QUALITY ASSURANCE

A. Standards: except as otherwise indicated, comply with Timber Construction Standards AITC 200-83 and ASTM D905.

B. Grading: provide decking graded by a recognized agency, complying with requirements of the American Lumber Standards Committee and PS 20 and the Western Wood Products Associateion, under the WWPA's National Evaluation Service Committee Report NER-QA 220.

C. Manufacturer Qualification: provide factory glued laminated decking produced by an AITC licensed firm.

1.03 PRODUCT HANDLING

A. Keep wood decking dry at all times. Do not store in areas of high humidity.

1.04 JOB CONDITIONS

A. Time delivery and installation of wood decking work to avoid extended on site storage and avoid delaying work of other trades.

1.05 SUBMITTALS

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: comply with applicable grading rules published by the grading agency as follows, for the species of lumber used:
   1. SPIB - Southern Pine Inspection Bureau.
   2. WWPA - Western Wood Product Association.

B. Lumber Species: Douglas Fir, Western Larch or Southern Pine at fabricator's option as long as it is FSC certified lumber. The basis of design for the roof planking is FSC certified southern pine glu-laminated 2"x6" nominal T&G decking with a moisture content

of 10-12% and 15% maximum with a fully exterior, phenolic resorcinol waterproof adhesive.

C. Grade for Solid Planking: where unmatched dimension lumber is shown as wood plank decking, provide the following grade lumber of the required species (National Grading Rule):
   1. Grade: select structural joists and planks.

D. Moisture Content: except as otherwise indicated, provide wood decking fabricated from lumber of 15% or similar indication in grade markings or certification of grade.

E. Dressing, Plank Decking: dressed on four sides (S4S).

F. Fasteners: provide nails complying with sizes recommended by deck manufacturer for the thickness and type deck used; and complying with FS FF-N-105, type II, Style 10; common, ring-shank. All nails and fasteners shall be stainless steel.

G. Penetrating Sealer: manufacturer's standard translucent penetrating wood sealer, which will not interfere with application of wood stain and transparent finish or paint finish.

H. Refer to 9T Series sections for required finishes.

2.02 FABRICATION

A. General: comply with width, thickness, pattern and length requirements as shown and specified. Comply with applicable grading rules.
   1. Except as otherwise indicated, fabricate decking members to lengths required for span applications as indicated.
   2. Fabricate lumber into decking units with natural bow or crown of each piece up, to provide camber.

B. Seal Coat: after fabrication and surfacing of each unit, apply a heavy saturation coat of penetrating sealer, except for treated wood where treatment has included a water repellent.

2.03 FACTORY FINISHING

A. Wipe Stain Finish: manufacturer's standard "dry-appearance" penetrating acrylic stain and sealer, oven dried and resistant to mildew and fungus.

2.04 FACTORY APPLIED PROTECTION

A. Provide protective slip sheet between finished surfaces in bundles of factory finished decking.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the supporting structure and conditions under which wood decking is to be installed and notify the contractor in writing of conditions detrimental to proper completion of work. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to installer.

3.02 INSTALLATION

A. General: comply with manufacturer's instruction and AITC recommendations for installation of decking.
   1. Where treated members must be cut during erection, apply a heavy brush coat of the same treatment, complying with AWPA Standard M4.

B. Handle bundles of decking to prevent damage to visible surfaces.

C. Maintain expansion spaces as shown, and as required by applicable AITC Standards and as recommended by decking manufacturer.

D. Nail decking as indicated, or if not otherwise indicated, comply with manufacturer's instructions and with AITC recommendations for nailing wood decking. Comply with governing regulations.

E. Repair damaged surfaces and finishes after completion of installation, or replace damaged decking as directed where damage is beyond satisfactory repair.

3.03 PROTECTION

A. Advise contractor of necessary limitations on heating, ventilating and air conditioning, in order to avoid damage or deterioration of wood decking.

END OF SECTION 06125

SECTION 06135

TIMBER TRUSSES

PART 1- GENERAL

1.01 WORK INCLUDED

A. Provide and install timber trusses at the roof consisting of concealed stainless steel plate and mortise/tenon connections and members which are fabricated from dimension lumber.

1.02 RELATED WORK

A. Section 06100: Rough Carpentry

B. Section 06180: Glued-Laminated Structural Units

1.03 QUALITY ASSURANCE

A. Truss Design Standard: design, detail, and fabricate timber trusses to recommendations and specifications of AITC.

B. Wood Structural Design Standard: National Design Specifications for Wood Construction published by N.F.P.A.

C. Grading: provide lumber graded by a recognized agency, complying with requirements of the American Lumber Standards Committee and PS 20.

1.04 SUBMITTALS

A. Submit shop drawings showing species, sizes and stress grades of lumber to be used; pitch, span, camber configuration and spacing for truss required; type, size, material, finish, design value and location of connector plates and bearing and anchorage details.

B. Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in the state where trusses are fabricated if shop pre-fabricated.

1.05 DELIVERY, STORAGE AND HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and AITC recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.

B. Time delivery and erection of trusses to avoid extended on site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber: nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for dressed lumber, S4S, unless otherwise indicated. Provide kiln dried lumber with 15% maximum moisture content at time of dressing.

B. Lumber Species & Grade: Refer to structural plan set.

2.02 CONNECTIONS AND ANCHORAGES

A. Stainless steel, 316 grade.

B. Fasteners and Anchorages: provide size, type, material and finish indicated, complying with applicable standards for nails, screws, bolts, nuts and washers, and anchoring devices. All shall be stainless steel.

2.03 FABRICATION

A. General: cut truss members to accurate lengths, angles and sizes to produce close fitting joints with proper wood to wood bearing in assembled units.

B. Fabricate connections by mortise and tenon with bolts as indicated on the drawings. The ridge-peak connection is to be a concealed, galvanized steel plate. Refer to drawings for size, thickness and bolting, plus interconnection to other clips for framing members.

C. Assemble truss members in design configuration indicated.

PART 3 - EXECUTION

3.01 GENERAL

A. Erect and brace trusses to comply with recommendations of manufacturer and the AITC.

B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

C. Hoist units in place by means of proper lifting equipment suited to sizes and types of trusses required, applied at proper lift points as recommended by fabricator, exercising care not to damage truss members or joints by out of plane bending or other causes.

D. Provide temporary bracing as required to maintain trusses plumb, parallel and in proper location, until permanent bracing is installed.

E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

G. Do not cut or remove truss members.

END OF SECTION 06192

SECTION 06172
LAMINATED VENEER LUMBER

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish labor, materials, and related items for Laminated Veneer Lumber (LVL) members which are fabricated from thin layers of wood, glued together into a continuous lumber member, where indicated on the drawings.

1.02 RELATED WORK

A. 06100: Rough Carpentry

B. 06130: Heavy Timber Framing

1.03 QUALITY ASSURANCE

A. Wood Structural Design Standard: National Design Specifications for Wood Construction published by N.L.M.A.

B. Fabricator's Qualifications: minimum of 3 years experience in successful fabrication of laminated veneer lumber comparable to type indicated for this project. LVL to be manufactured in a plant and under a process approved by the National Research Board.

1.04 SUBMITTALS

A. Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in the state where laminated veneer lumber is fabricated.

B. Shop drawings to show sizes, lengths, bearing amounts, and connectors being proposed for the LVL.

1.04 DELIVERY, STORAGE AND HANDLING

A. Handle and store members with care, and in accordance with manufacture's instructions to avoid damage from bending, overturning or other cause for which members are not designed to resist or endure.

B. Time delivery and erection of LVL members to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of members.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood: Douglas Fir veneer layers of 1/10" to 1/8" thickness. Layers to be glued in a continuous process with all grain parallel with the length of the member. Laminated veneer lumber shall be of single one-piece length, free of finger joints, scarf joints or mechanical connections in full length members.

B. Adhesive: waterproof, meeting the requirements of ASTM D-2559.

C. Fasteners and Anchorages: provide size, type, material and finish indicated, complying with applicable standards for nails, screws, bolts, nuts and washers, and anchoring devices. All steel shall be stainless steel 316 grade.

PART 3 - EXECUTION

3.01 GENERAL

A. Erect and brace members to comply with recommendations of manufacturer.

B. Erect beams with plane of beam wide face vertical (plumb) and parallel to each other, located accurately at design spacings indicated.

C. Provide temporary bracing as required to maintain plumb member and in proper location, until permanent bracing is installed.

D. Anchor beams securely at all bearing points to comply with methods and details indicated.

E. Do not cut or drill LVL members without specific approval of the Architect.

END OF SECTION 06172

SECTION 06401

EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Provide exterior architectural woodwork:

1. Standing and running trim and rails.
2. Composite decking (Trex)

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, product data, mock-ups of typical trim and moldings.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards."

C. Standards: Woodwork Institute of California (WIC) "Manual of Millwork."

D. Contractor shall arrange a preconstruction meeting with the wood polymer deck manufacturer (Trex) and installer and Owner and Architect prior to decking installation to review installation procedures and details.

E. Wood Polymer Composite Decking Warranty: Customized commercial warranty for ten (10) years of coverage against splintering, splitting, checking, rot, decay damage, termite damage or any structural damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Exterior Standing and Running Trim and Rails:

1. Species: Clear heart western red cedar.
2. Grade: A Clear, NLGA 200b, WCLIB 102-c, pieces with excellent appearance. Finger jointed material, or material with knots will not be accepted.
3. Finish: Solid body stain.

B. Auxiliary Materials:

1. Felt Underlayment: Asphalt saturated organic felt, unperforated, ASTM D 226, Type 1, No. 15.

C. Fasteners:

1. Nails: Stainless steel.

2. Screws and Anchors: Stainless steel, type required for secure anchorage.
3. Wood Polymer Composite Decking fasteners: Stainless steel # 10 , 3” long flat head square drive deck screws.

D. Wood Polymer Composite Decking:

1. 2 x 6 nominal wood polymer composite as manufactured by Trex. Board length to be continuous from concrete beam to concrete beam with no butt joints between boards. No substitutions on material manufacturer will be accepted.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide work to sizes, shapes, and profiles indicated. Install work to comply with quality standards referenced. Back prime all surfaces prior to installation and install plumb, level and straight with tight joints; scribe work to fit.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Use stainless steel fasteners. Coordinate with work of other sections.

C. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.

D. Repair minor damage, clean and protect.

E. Installing Wood Polymer Composite Decking (Trex) in accordance with manufacturers instructions and the following:

1. Install two screws in each deck board at each joist.
2. Install decking in board lengths that span in one piece between concrete beams. There shall be no end board to end board joints.
3. Space decking boards with decking spacing tool supplied by the manufacturer.
4. Leave space between boards in accordance with manufacturers instructions.
5. Install decking straight, with maximum deviation from straight line for any one board being 1/16”.

END OF SECTION

SECTION 06402
INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Provide interior architectural woodwork:

1. Misc interior wood trim.
2. Prelaminated Panels.

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1.02 SUBMITTALS

A. Submit for approval samples for color selection, shop drawings, product data, mock-ups of typical trim and moldings.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Casework Hardware and Auxiliary Materials:

1. Hardware Standard: ANSI/BHMA A156.9
2. Hardware finish and base material: Satin stainless steel.

B. Interior Wood Trim:

1. Species: Pine.
2. Grade: Select clear. All trim to be 100% knot free.

C. Prelaminated Panels FRP:

1. Type: “Fiber-Lite” F3P500, Textured Fiberglass (FRP) .030” facing, “Nudo Products, Inc.”, color as selected by the Architect. FRP to be laminated in the factory to ½” thick fir exterior grade A/C plywood sheathing.
2. Components: “Nudo Products, Inc.” Vinyl ISC Interior Angle, Cap OSC Exterior, and surface mounted Base Cove Moldings, Stainless Steel Nails, “Henery” #417 or “TACC” #216 panel adhesive. Refer to connection details in the Drawings.

D. Auxiliary Materials:

1. Screws: Stainless steel.
2. Nails: Stainless steel.
3. Anchors: Type required for secure anchorage.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide work to sizes, shapes, and profiles indicated. Install work to comply with quality standards referenced. Conceal fasteners to the greatest extent practical. Back prime work and install plumb, level and straight with tight joints; scribe work to fit.

B. Install continuous wood blocking in the wall construction at all joints in prelaminated panels. Cut and install prelaminated panels with joint locations as shown on the Drawings.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.

D. Comply with manufacturer's requirements for cutting, handling, fastening and working treated materials.

C. Repair minor damage, clean and protect.

D. Install prelaminated panels to wood studs with glue and no exposed fasteners.

END OF SECTION

SECTION 07310

SHINGLES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide asphalt shingles for roofing applications.

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1.02 SUBMITTALS

A. Submit for approval samples, product data, mock-ups, warranty, extra stock.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Pre-installation conference with roof manufacturers representative. Field-Constructed Mock-Up typical area.

1.04 WARRANTY

A. Shingle Warranty: Manufacturer's 50 year warranty against manufacturers defects. Wind warranty upgrade to 130 mph with CertainTeed starter and CertainTeed hip and ridge.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asphalt Shingles:

1. Manufacturers: CertainTeed.
2. Type: Architectural, fiberglass strip shingles, CertainTeed “Landmark Premium”.
3. Color: Moire Black.
4. 130 mph warrantee required to used CertainTeed starter, hip and ridge to obtain 130mph warranty.
4. Accessories: Hip and ridge shingles; underlayment 15 lb. asphalt felt, ASTM I 4869, Type I; rubberized asphalt perimeter underlayment (water and ice shield); copper flashing and drip edge.

B. Fasteners:

1. Nails: Stainless steel roofing nails, as recommended by the manufacturer for salt water and 130mph wind exposure. Staples are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with recommendations of NRCA Steep Roofing Manual.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with

uniform appearance. Coordinate with work of other sections.

C. Install water protection (water and ice shield) sheet at hips, valley, ridges, and eaves.

D. Restore damaged components. Clean and protect work from damage.

E. Install roof shingle nail spacing in accordance with manufacturers instructions for high wind applications. **Install with a minimum of 6 nails per shingle in accordance with manufacturer instructions.**

F. If installed in weather below 50 degrees install sealant at tab ends and as required for cold weather installation in high wind areas in accordance with manufacturers instructions.

END OF SECTION

SECTION 07460
CEDAR WALL SHINGLES

PART 1 - GENERAL

1.01 SUMMARY

A. Wood Red Cedar shingles for siding applications.

1.02 SUBMITTALS

A. Submit for approval product data, warranty. Submit for approval sample of wood shingles.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wood Wall Shingles:

1. Type: No. 1 Grade Blue Label western red cedar re-sawn, re-butted and kiln dried, 18” in length w/ 5” exposure. Shingles shall be factory dipped in clear sealer before installation. Shingles shall arrive at the construction site pre-dipped. Submit sample to Architect for approval.
2. Accessories: Felt, 15# ASTM D 226 Type I.

B. Fasteners:

1. Nails: Stainless steel nails for wood shingles as recommended by the manufacturer for 130 mph wind exposure. Nails used with a nail gun must be stainless. Staples are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install cedar shingles over 15# asphalt felt.

C. Restore damaged components. Clean and protect work from damage.

D. Protect shingles from paint.

END OF SECTION

SECTION 07600
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Provide flashing and sheet metal:

1. Metal counterflashing and base flashing.
2. Exterior wall flashing and expansion joints.
3. Exposed metal trim.
4. Sheet metal accessories.
5. Metal step flashing.
6. Exterior flashing at head of window and door casing.
7. Exterior flashing at top of running trim.
8. Flashing as indicated on the Drawings.
9. Flashing pan at the sill of all louvers.

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Metal flashing warranty: Zinc coated copper manufacturers standard 25 year warrantee.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet Metal Flashing and Trim: Zinc Coated Copper: ASTM B 370, copper, 16 ounces per square foot. Manufacturer: Revere Copper Products, Inc., Revere FreedomGray. Copper flashing shall be coated with zinc / tin alloy on both sides approximitly 0.5 mils thick. Coating shall be 50 percent zinc and 50 percent tin. Zinc-Tin allow shall be applied by the hot dipped process.

B. Fabricated Units: Compliance with SMACNA Sheet Metal Manual.

C. Auxiliary Materials: Copper Nails, copper Screws, and other fasteners. Solder lead free tin compatible with Copper.

a. Grace Vycor V40: Install Grace Vycor 40 flashing where specifically indicated for Vycor flashing on the drawings. 40 mil thickness, cross laminated HDPE carrier film, rubberized asphalt adhesive, adhesive on one side, roll width as required for details. Install Vycor when temperatures are above 25 degrees F. Install in accordance with manufacturers written instructions. Vycor shall be exposed to sunlight for less that 30 days, Vycor must be covered after installation and limited to total sun exposure for a maximum total of 30 days.

D. Storage: Store flashing off the ground, in an enclosed structure. Do not allow water to sit on or between flashing materials. Do not store on the ground under a tarp such that condensation may form.

E. Handle metal flashing is a manner to reduce scratches, dents, discoloration or deformation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow recommendations of SMACNA Sheet Metal Manual. Allow for expansion. Isolate dissimilar materials.

B. Install materials and systems in accordance with Drawings and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Restore damaged components and finishes. Clean and protect work from damage.

D. Solder joints in metal flashings in conformance with ASTM specification B32. Use pure tin or lead free high tin. Before soldering metal flashing, the pre-weathered coating must be removed and surfaces to receive soldering chemically and or mechanically cleaned to produce clean, bright alloy.

F. Install folded expansion joints in flashings as recommended in SMACNA Sheet Metal Manual.

G. Install copper pan under the sill of all louvers.

END OF SECTION

SECTION 07901
JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide joint sealers at interior and exterior vertical and horizontal joints.

B. Coordinate joint sealant work with work of other sections.

1.02 SUBMITTALS

A. Submit for approval samples, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Urethane Elastomeric Joint Sealants:

1. Manufacturers: Pecora Corp., Sika Corp., Tremco or approved equal.
2. Type and Application: One part nonsag urethane sealant, ASTM C 920, for joints in vertical and horizontal surfaces, exterior and interior use.

B. Silicone Elastomeric Joint Sealants:

1. Manufacturers: Dow Corning, General Electric, Tremco or approved equal.
2. Type and Application: One-part nonacid-curing paintable silicone sealant, ASTM C 920, for joints in vertical and horizontal surfaces, modulus as required for application, exterior and interior use. .

C. Auxiliary Materials:

1. Plastic foam joint fillers.
2. Elastomeric tubing backer rods.
3. Bond breaker tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Examine substrate; report unsatisfactory conditions in writing. Beginning work means acceptance of substrates.

B. Provide sealants in colors as selected from manufacturer's standards.

C. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections. Clean and prime joints, and install

bond breakers, backer rods and sealant as recommended by manufacturers.

D. Depth shall equal width up to 1/2" wide; depth shall equal 1/2 width for joints over 1/2" wide.

E. Cure and protect sealants as directed by manufacturers. Replace or restore damaged sealants. Clean adjacent surfaces to remove spillage.

END OF SECTION

SECTION 08100
FLUSH FIBERGLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes The Following:
   1. Fiberglass Reinforced Plastic (FRP) Doors
   2. Fiberglass Resin Transfer Molded Door Frames

1.2 RELATED SECTIONS

A. Related Sections Include The Following:
   1. Division 0 – Bidding and Contract Requirements
   2. Division 1 – General Requirements
   3. Division 8 – Finish Hardware

1.3 QUALITY ASSURANCE

Test certification by an independent and accredited laboratory is required for the properties listed in this Quality Assurance section. Reports shall be made available upon request for each of the standards and certifications described below.

A. Reference Standards

   1. Door Properties

      a) Standard test method for steady state thermal transmission properties by means of the heat flow meter apparatus.
      b) Successfully completed 1,000,000 cycles test in accordance with:
         AAMA 920-03 – Specification for Operating Cycle Performance of Side-Hinged Exterior Door Systems.
         ANSI A250.4-2001 – Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings.
         NWWDA TM-7 Test Method to Determine the Physical Endurance of Wood Doors and Associated Hardware Under Accelerated Operating Conditions.
      c) Florida Building Code
         SFBC PA 201 Impact Procedures for Large Missile Impact
         SFBC PA 202 Uniform Static Load on Building Components
         SFBC PA 203 Products Subjected to Cycle Wind Pressure
         SFBC 3603.2 Forced Entry Test
         ASTM E 1886 Impact and Cycling, Large Missile Impact
         ASTM E 1996 Specifications for Performance of Exterior Doors
         ASTM C 518 Heat Transfer
         ASTM D 1761 Mechanical Fasteners

   2. Laminate Properties

      Door face plate is a **minimum of 0.125 inch thick** fiberglass reinforced plastic molded into one continuous sheet starting with a **25 mil resin-rich gelcoat layer resin integrally molded** with multiple layers of 1.5 oz. sq ft fiberglass mat and one layer of **18 oz per square yard fiberglass woven roving** saturated with special resin. Door **plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass resin.**

Laminated **plate by itself** evaluated in accordance with Florida Building Code TAS 201 **Large Missile Impact** Test as per ASTM-1996-05b, Standard Specification for Performance of Exterior Windows, Curtain Wall, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes**. The missile (a 2 x 4 with a weight of 9 lbs shot from a cannon at a velocity of 50 ft/sec) did not penetrate the door face plate.**

a) ASTM D 638 Tensile Strength Properties of Plastic
b) ASTM D 790 Flexural Strength Properties of Plastic
c) ASTM D 2583 Indention Hardness of Plastics
d) ASTM D 256 Izod Pendulum Impact Resistance
e) ASTM D 792 Density/Specific Gravity Of Plastics
f) ASTM D 1761 Mechanical Properties of Fasteners
g) ASTM E 84 Surface Burning Characteristics of Materials
h) ASTM G 155 Xenon Light Exposure of Non Metallic Materials
i) ASTM D 635 Method For Rate of Burning
j) ASTM D 2843 Smoke Density
K) **ASTM D 1929 SELF IGNITION TEMPERATURE PROPERTIES**
L) **SFBC PA 201 IMPACT PROCEDURES FOR LARGE MISSILE IMPACT**

3. Core Properties

a) ASTM C 177 Thermal Properties of Materials
b) ASTM D 1622 Density and Specific Gravity
c) ASTM E 84 Surface Burning Characteristics of Materials
d) WDMA TM-10 and TM-5 Firestop ASTM E 152 U.L 10(b)
e) ASTM E90-04- Sound Transmission Loss
f) ASTM E413-04- Classification for Rating Sound Insulation
g) ASTM E1332-90- Standard Classification for Determination of Outdoor-Indoor Transmission Class
h) ASTM E2235-04- Standard Test for Determination of Decay Rates for Use in Sound Insulation Methods

B. Qualifications

1. Manufacturer Qualifications: A company specialized in the manufacture of fiberglass reinforced plastic (FRP) doors and frames as specified herein **with a minimum of 30 years documented experience** and with a record of successful in-service performance for the applications as required for this project.
2. Installer Qualifications: An experienced installer who has completed fiberglass door and frame installations similar in material, design, and extent to those indicated and whose work has resulted in construction with a record of successful in-service performance.
3. Source limitations**: Obtain fiberglass reinforced plastic doors and resin transfer molded fiberglass frames through one source fabricated from a single manufacturer, including fire rated fiberglass frames. This ensures complete uniformity of physical properties and consistency in the resin chemistry tailored for this application.**
4. Source limitations: Hardware and accessories for all FRP doors as specified in Section 08710 shall be provided and installed by the fiberglass door and frame manufacturer.

1.4 SUBMITTALS

A. Product Technical Data Including:
1. Acknowledgment that products submitted meet requirements of standards referenced.
2. Manufacturer shall provide certificate of compliance with current local and federal regulations as it applies to the manufacturing process.
3. Manufacturer's installation instructions.

4. **Schedule of doors** and frames indicating the specific reference numbers used on the **owner's project documents, noting door type, frame type, size, handing and applicable hardware.**
5. Details of core and edge construction. including factory construction specifications.
6. Certification of manufacturer's qualifications.

B. Submittal Drawings for Customer Approval Shall be Submitted Prior to Manufacture and Will Include the Following Information and Formatting:
   1. **Summary door schedule indicating the specific reference numbers as used on owner's drawings, with columns noting door type, frame type, size, handing, accessories and hardware.**
   2. **A drawing depicting front and rear door elevations showing hardware with bill of material for each door.**
   3. **Drawing showing dimensional location of each hardware item and size of each door.**
   4. **Individual part drawing and specifications for each hardware item and FRP part or product.**
   5. **Construction and mounting detail for each frame type.**

C. Samples:
   1. **Provide one complete manufactured door sample which represents all aspects of the typical manufacturing process, including molded in gelcoat color and face plate construction. One edge should expose the interior of the door depicting the unique u-shaped continuous piece stile and rail, hardware reinforcement and core material.**

D. Operation and Maintenance Manual
   1. Include recommended methods and frequency for maintaining optimum condition of fiberglass doors and frames under anticipated traffic and use condition.
   2. Include one set of final as built drawings with the same requirements as mentioned in Section B above.
   3. Include certificate of warranty for door and frame listing specific door registration numbers.
   4. Include hardware data sheets and hardware manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Each door and frame shall be delivered **individually crated** for protection from damage in cardboard containers, **clearly marked** with project information, door location, specific reference number as shown on drawings, and shipping information. **Each crate shall contain all fasteners necessary for installation as well as complete installation instructions.**
   1. Doors shall be stored in the original container on edge, out of inclement weather for protection against the elements.
   2. Handle doors pursuant to the manufacturer's recommendations as posted on outside of crate.

1.6 WARRANTY

A. All fiberglass doors and frames have a lifetime guarantee against failure due to corrosion. Additionally, fiberglass doors and fiberglass frames are guaranteed for ten years against failure due to materials and workmanship, including warp, separation or delamination, and expansion of the core.
B. On site assistance available.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with the Contract Documents, the following manufacturers are acceptable:

A. Chem-Pruf Door Co., Ltd., P.O. Box 4560 Brownsville, Texas 78523 Phone: 1-800-444-6924-7943, Fax: 956-544-7943, Website: www.chem-pruf.com

2.2 FRP DOORS

A. **Doors** shall be made of **fiberglass reinforced plastic** (FRP) using **Class 1 premium resin with no fillers that is specifically tailored to resist chemicals and contaminants typically found in environment for which these specifications are written.** Doors shall be 1 ¾ inch thick and of flush construction, **having no seams or cracks**. For **consistency in the resin chemistry** tailored for this application and to **maintain the same physical properties throughout the structure**, all fiberglass components including face plates, stiles and rails and frames **must be fabricated by the same manufacturer**. Components obtained through various outside sources for plant assembly will not be accepted.

B. **Door Plates** shall be **0.125 inch thick minimum**, molded in one continuous piece, starting with **25 mil gelcoat of the color specified, integrally molded** with multiple layers of 1.5 ounces per square foot fiberglass mat and **one layer of 18 ounce per square yard fiberglass woven roving**. Each layer shall be individually laminated with resin as mentioned above. **Door plate weight shall not be less than 0.97 lbs per square foot at a ratio of 30/70 glass to resin**. **Plate alone to withstand Large Missile Impact per FBC TAS 201.** Face plates manufactured using the pultrusion process does not allow for a smooth molded gelcoat finish, the use of woven roving for adequate plate thickness, strength and weight, or the appropriate glass to resin ratio and will not meet the quality standards of this project.

C. **Stiles and Rails** shall be constructed starting from the outside toward the inside, with a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall **be molded in one continuous piece to a U-shaped configuration** and to the exact dimensions of the door. In this manner there will **be no miter joints** and **disparate materials** used to form the one-piece stile and rail.

D. **Core** material shall be **Polypropylene plastic honeycomb core with a non woven polyester veil for unparalleled plate bonding, 180 PSI typical compression range** unless otherwise requested**.**

E. **Internal Reinforcement** shall be #2 SPF of sufficient amount to adequately support required hardware and function of same.

F. **Finish** of door frame shall be identical **with 25 mil resin-rich gelcoat of the specified color integrally molded in at time of manufacture resulting in a smooth gloss surface that is dense and non-porous.** To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating an **impermeable outer surface, uniform color throughout**, and a **permanent homogeneous bond** with the resin/fiberglass substrate beneath**. Only the highest quality gelcoat will be used to ensure enduring color and physical properties**. Paint and/or post application of gelcoat results in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and **frame must be field repairable** without compromising the integrity of the original uniform composite structure, function or physical strength.

2.3 FRP FRAMES

A. **Frames** (rated and non-rated) shall be **fiberglass** and manufactured using **the resin transfer method creating one solid piece** (no voids) with complete uniformity in color and size. Beginning with a minimum **25 mil gelcoat layer molded** in and a minimum of two layers of continuous strand fiberglass mat saturated with resin, the frame will be of one-piece construction with molded stop. All frame profiles shall have a core material of 2 psf polyurethane foam. **Metal frames or pultruded fiberglass frames will not be accepted.**

B. **Finish** of frame shall be identical to the door with **25 mil resin-rich gelcoat of the specified color integrally molded** in at time of manufacture. To achieve optimum surface characteristics, the gelcoat shall be cured within a temperature range of 120F to 170F creating **an impermeable outer surface, uniform color throughout**, and **a permanent homogeneous bond** with the resin/fiberglass substrate beneath. Only the highest quality gelcoat will be used to ensure enduring color and physical properties. Paint and/or post application of gelcoat result in poor mechanical fusion and will be deemed unacceptable for this application. The finish of the door and **frame must be field repairable** without compromising the integrity of the original uniform composite structure, function or physical strength.

C. **Jamb/Header** connection shall be mitered for tight fit.

D. **Internal Reinforcement** shall be continuous within the structure to allow for mounting of specified hardware. Reinforcing material shall be a **dense matrix of cloth glass fibers and premium resin** with a minimum hinge **screw holding value of 1000 lbs per screw. All reinforcing materials shall be completely encapsulated**. Documented strength of frame screw holding value after third insert must be submitted. Dissimilar materials, such as steel, will be deemed unacceptable as reinforcement for hardware attachment.

E. **Mortises** for hardware shall be accurately machined by **CNC** to hold dimensions to +/- 0.010 inch in all three axis.

F. **Hinge pockets** shall be accurately machined **by CNC to facilitate heavy duty hinges at all hinge locations**, using shims when standard weight hinges are used.

2.4 HARDWARE

A. See Section 08710

B. The special nature of this material requires that all related **hardware as specified must be furnished and installed by the door frame manufacturer to maintain product quality and function as well as to ensure sufficient support/reinforcement, precision tooling and proper sealing methods are provided.**

PART 3 – EXECUTION

3.1 INSTALLATION CONDITIONS

A. Verification of Conditions
   1. Verify openings are correctly prepared to receive doors and frames.
   2. Verify openings are correct size and depth in accordance with submittal drawings.

B. Installer's Examination
   1. Door installer shall examine conditions under which construction activities of this section are to be performed and submit a written report to general contractor if conditions are unacceptable.
   2. General Contractor shall submit two copies of the installer's report to the architect within 24 hours of receipt.
   3. Installer shall not proceed with installation until all unacceptable conditions have been corrected.

3.2 INSTALLATION

A. Doors shall be delivered at job site **individually crated**. Each crate to be clearly marked with the specific opening information for quick and easy identification.
B. All single doors to be **shipped completely assembled in the frame with hardware installed**. Double doors to be **prehung at the factory to ensure a proper fit** and that hardware functions properly, then disassembled for shipping purposes.
C. Install door opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.
D. Field alteration of doors or frames to accommodate field conditions is strictly prohibited.
E. Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions.

3.3 ADJUSTING

A. Adjust doors in accordance with the door manufacturer's maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.
B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instruction.

3.4 CLEANING

A. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer's maintenance instructions.

3.5 PROTECTION OF INSTALLED PRODUCTS

A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

A. Provide joint sealers at interior and exterior vertical and horizontal joints.

B. Coordinate joint sealant work with work of other sections.

END OF SECTION

SECTION 08330
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide overhead coiling doors:

1. Exterior units for use as counter doors in the vending building.

B. Performance requirements:

1. Structural Performance: Provide exterior overhead coiling doors capable of withstanding the effects of the following loads and stresses without evidence of permanent deformation of door components: Basic Wind Speed: 130 miles per hour; Importance Factor: 1.15; Exposure Category: C.

1.02 SUBMITTALS

A. Submit for approval shop drawings, product data, and certification that doors meet specified wind loading.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for five years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Overhead Door Corp.

B. Overhead Coiling Doors:

1. Type: rolling Door, 620 Series Stormtite Service Doors.
2. Door Curtain: Interlocking roll formed slats.
3. Slat Profile: F-265, 18 gauge aluminum.
4. Operation: Electric motor operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
    a. Sensing Edge Protection: Electric sensing edge.
    b. Operator Controls: Push-button and key operated control stations with open, close, and stop buttons for flush mounting for interior and exterior locations.
5. Mounting: Face of wall.
6. Finish: Slats and hood shall be aluminum with clear anodized finish.
7. Color: Powder coat finish in color as selected by the Architect from manufacturers standard colors.
8. Wind load design: sufficient for Miami Dade county requirements and 120 mph.
9. Weatherseals: Vinyl bottom seal, exterior guide and internal hood seals.
10. Extruded aluminum bottom bar.
11. Weather stripping along all guides.
12. Galvanized steel brackets.
13. Counterbalance: Helical torsion spring type designed for standard 50,000 cycle life design.

Counterbalance shall be housed in a steel tube supporting the curtain with deflection limited to 0.03” per foot of span. Counterbalance shall be adjustable.

14. Hood: Aluminum with intermediate supports as required. Provide and install internal hood baffle weatherseal.
15. Locking: Cylinder lock, lockable by key from interior or exterior.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install assemblies complete with all hardware, anchors, inserts, supports and accessories. Test and adjust operation.

C. Provide weatherstripping and windlocks for doors installed in exterior walls.

D. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 08710
DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Provide the following:

1. Hardware for swinging doors.

1.02 SUBMITTALS

A. Submit for approval samples, product data, hardware schedule proposed for use based on Owner's requirements.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Handicapped Accessibility: ANSI A117.1, AADAG, and local requirements.

C. Materials and Application: ANSI A156 series standards.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Schlage, Stanley, Chem-Pruf, Trimco, Glynn- Johnson or approved equal.

B. Swinging Door Hardware:

1. Hinges: Stainless steel, satin finish, nonremovable stainless steel pin, half surface, ball bearing, Chem-Pruf 316, US 32D finish, ¼” diameter stainless steel through bolts and stainless steel lag bolts.
2. Door Pulls: Trimco, stainless steel, heavy duty, 1804-4. Provide one door pull on each side of active doors (two per door). Provide knurling on pulls where required.
3. Threshold: Hager 3” 402S aluminum, and / or as shown on the Drawings.
4. Door bottom sweep: Hager 778S aluminum.
5. Weather stripping: Hager 896S, aluminum, silicone gasket .
6. Holders: Glynn- Johnson W20 wall holder, stainless steel.
7. Dead Bolt: Sargent, 484 Deadlock, keyed on both sides of door.
8. Kickplates: Stainless steel, 12” high x 2” less than door width.
9. Closers: Norton, series 1600, size 4, barrier free adjustable (BF), corrosion resistant series (SS) with stainless steel arm. Mount closer on inside of all exterior doors. For interior doors mount closer on the smaller room side of the door, concealed from public view (inside bathrooms and inside mechanical closets).
10. Keying: Master keying with individual key control system, two keys per door.
11. Finish: All hardware shall be satin stainless steel US32D (630).
12. Door Stops: Glynn-Johnson as appropriate for application
13. Door hold opens: Glynn-Johnson # 44, cast brass body, kick down holder, one per door leaf, typical.

C. Auxiliary Materials:

1. Provide and install **flush** mounted Knox box for fire emergency keys.
2. Fasteners: Stainless steel bolts and stainless steel wood screws.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Follow guidelines of DHI "Recommended Locations for Builder's Hardware and hardware manufacturers' instructions.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Adjust operation, clean and protect.

END OF SECTION

SECTION 08800
MIRRORS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide one mirror in Bathroom.

1.02 SUBMITTALS

A. Submit for approval samples, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1.04 WARRANTY

A. Glass Warranty for mirror glass, manufacturer’s 10 year warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: AFG Industries, Cardinal, Libby Owens Ford or approved equal.

B. Glass:

1. Primary Glass Products: Clear float glass, ASTM C 1036.
2. Mirrors: Silvering and protective coatings.
3. Thickness: ¼ inch plate glass.

C. Glazing Accessories:

1. Mirror adhesive.

3.01 INSTALLATION

A. Inspect framing and report unsatisfactory conditions in writing.

B. Comply with FGMA “Glazing Manual” and manufacturers instructions and recommendations. Use manufacturers recommended adhesive and sealants.

C. Set mirrors on stainless steel concealed clips and adhere to wall with mirror adhesive.

D. Remove and replace damaged mirrors. Wash, polish and protect all mirrors supplied under this section.

END OF SECTION

SECTION 09705
RESINOUS FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide resinous epoxy flooring system including cleaning, priming, epoxy coatings and finish coatings.

1.02 SUBMITTALS

A. Submit for approval samples, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Contractor shall arrange a preconstruction meeting with the Owner, Architect, manufacturers representative, and installer to discuss the epoxy floor installation prior to the installation of the plywood underlayment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Stonhard or approved equal.

B. Resinous Flooring:

1. Type: Stonclad GR. Finish with Stonkote GS4 and Stonkote HT4. Stonclad GR ia an environmentally friendly four-components, troweled, epoxy mortar system utilizing recycled materials and rapidly renewable soy based components. The system utilizes 30% recycled glass blended with epoxy resin, amine curing agent and sooy based additives. Apply to thickness of 3/16”. Designed for thermal shock conditions of unheated spaces.
2. Surface: Slip-resistant surface.
3. Store components in weatherproof space temperature controlled to between 60 to 85 degrees F in a dry area.
4. Color: As selected by Architect from standard colors.
5. Substrate preparation: The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. The substrate shall be cleaned and free of all construction dust. Laitance and unbound cement particles must be removed by mechanical methods. Prepare surface as recommended by manufacturer.
6. Priming: The use of Standard Primer is necessary for all applications. The Atandard Primer must be tacky during the application of Stonclad GR. If the primer becomes tack-free, the area must be re-primed to continue the application.

C. Related Materials:

1. 15 lb. Asphalt felt, ASTM I 4869, Type I.
2. Expanded metal lath, ASTM C 847, self furring galvanized steel diamond mesh or rib lath. Install lath with ring shank galvanized steel or stainless steel nails at 6” on center.
3. Low modulous urethane caulk, compatible with epoxy flooring system.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Prepare surfaces and install materials and systems in accordance with manufacturer's instructions and approved submittals.

B. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Restore damaged finishes. Clean and protect work from damage.

D. Install plywood underlayment with staggered joints. Caulk each plywood joint with material acceptable to epoxy flooring manufacturer.

E. Material must be applied immediately after mixing, product has a working time of 25 minutes at 70 degrees F.

F. A screed Applicator is to be used to distribute the mixed Stonclad GR onto the floor. Steel finishing trowls are used to compact and smooth the surface of the material to the required thickness.

G. DO NOT attempt to install material if the temperature of Stonclad GR components and substrate are not within 60 to 85 degrees F.

H. DO NOT use water or steam in the vicinity of the application.

END OF SECTION

SECTION 09900
PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide the following:

1. Painting for interior of all wood surfaces to be epoxy paint.

1.02 SUBMITTALS

A. Submit for approval samples of colors selected on actual construction samples, product data, 4' by 4' mock-ups in the field on actual building components, extra stock

B. Product Data: Manufacturer's data sheets on each paint and coating product should include:
1. Product characteristics
2. Surface preparation instructions and recommendations
3. Primer requirements and finish specification
4. Storage and handling requirements and recommendations
5. Application methods
6. Cautions

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: Compliance with VOC and environmental regulations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Benjamin Moore & Co., 101 Paragon Drive, Montvale, NJ 07645, Tel (201) 573-9600. First-line commercial-quality products for all coating systems, color to be selected by Architect.

B. Product Line

1. WOOD- Trim, Casing, Ply-bead, Roof decking and areas indicated on drawings
   A. Semi-Gloss Finish
      1st Coat: Super Spec HP Waterborne Polyamide Epoxy Metal Primer (P42-70) or
      Fresh Start All-Purpose 100% Acrylic Primer (023)
      2nd Coat: Super Spec Interior Latex Acrylic Epoxy Coating (256)
      3rd Coat: Super Spec Interior Latex Acrylic Epoxy Coating (256)
      Follow manufacturer’s guidelines for application.

2.02 ACCESSORIES

A. Coating Application Accessories:
1. Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean up materials required per manufacturer’s specifications.

B Paints and Coatings - General:

1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such a procedure is specifically described in manufacturer's product instructions. VOC's need to be confirmed by using the products MSDS sheets.

2. Manufactured PVC components are to be factory primed and factory finished.

C. Primers:

1. Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Comply with all manufacturers instructions including temperature and moisture requirements. Coordinate with work of other sections.

D. Match approved mock-ups for color, texture, and pattern. Re-coat or remove and replace work which does not match or shows loss of adhesion. Clean up, touch up and protect work.

E. Protect finished coatings from damage until completion of project.

F. Apply coatings using methods recommended by manufacturer.

G. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

3.2 PAINT SCHEDULE

INTERIOR:

General: Painting for interior of all wood surfaces.

Timbers, Trusses, Wood trim, Roof Decking	Semigloss	1 coat latex primer, 2 coats latex epoxy

END OF SECTION

SECTION 09931
WOOD STAINS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide stain finish and surface preparation for all exterior wood surfaces. Cedar wall shingles shall be shipped to the site with clear preservative applied to shingles.

1.02 SUBMITTALS

A. Submit for approval samples of colors selected on actual construction samples, product data, 4' by 4' mock-ups, extra stock.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: Compliance with VOC and environmental regulations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Cabot, Glidden Co., Benjamin Moore, Pratt and Lambert, Sherwin Williams or approved equal. First-line commercial-quality products for all stain systems, color to be selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Inspect surfaces, report unsatisfactory conditions in writing; beginning work means acceptance of substrate.

B. Comply with manufacturer's instructions and recommendations for preparation, priming and coating work. Coordinate with work of other sections.

C. At existing areas to be repainted, remove blistered or peeling paint to sound substrates. Remove chalk deposits and mildew and wash all surfaces with mild detergent. Perform related minor preparation including caulk and glazing compounds.

D. Match approved mock-ups for color, texture, and pattern. Re-coat or remove and replace work which does not match or shows loss of adhesion. Clean up, touch up and protect work.

3.2 STAIN SCHEDULE

EXTERIOR:

A. Exterior Wood Shingles: Clear wood finish and preservative suitable for Red Cedar Shingles. Dip shingles in clear wood preservative before shipping shingles to the site.

B. Wood including: Trim, Exposed Framing, Columns, Soffits, Ceilings, Rafter Tails, Beams, Fascia and all exposed wood (unless noted otherwise): Solid body stain, water base, 2 coats, over

primer, color selected by Architect. The pressure treated first floor main deck joists are not to be stained.

END OF SECTION

SECTION 10200

LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide louvers and vents:

1. Fixed blade fiberglass wall louvers that match exactly the existing louvers on the existing adjacent buildings.
2. Screens.

1.02 SUBMITTALS

A. Submit for approval shop drawings.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fiberglass Louvers:

1. Fabricate to dimensions indicated.
2. Manufacturer: CHEM-PRUF Door Company, (1800 444 6924). (Same mfg as fiberglass door spec)
3. Materials: All parts, jambs, header, sill, slats shall be made of gelcoated fiberglass reinforced plastic (FRP).
   a. Construction: One-piece molded cross-section, minimum of 25 mil gel coat applied in mold, minimum of tow (2) layers continuous strand fiberglass mat, saturated with resins.
   b. Continuous Strand Glass Fiber Mat: Minimum of 4.5 ounces per square foot weight of glass material.
   c.
4. Fasteners: Stainless steel vandal resistant screws.
5. Finish: Custom color gelcoat finish color as selected by the Architect.

B. Removable Covers:

1. Fabricate from 3/8” FRP. Install screen installation hardware to plastic panel. Covers to be installed on exterior of all louvers.

C. Louver Accessories:

1. Fiberglass removable insect screens. Screens shall be installed on the interior of all louvers.
2. Stainless steel vandal resistant fasteners.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Take field measurements prior to fabrication. Install units plumb and level; isolate dissimilar materials to prevent corrosion. Touch-up damaged coatings.

B. Provide anchors, supports and accessories as needed. Provide gaskets, flashings and fillers as necessary to make installation water tight.

C. Install wall louver opening assemblies in accordance with shop drawings and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.

D, Site tolerances: Maintain plumb and level tolerance specified in manufacturer's printed installation instructions.

E. Install louvers over ice and water shield and copper pan flashing.

END OF SECTION

SECTION 10425

SIGNS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide building signage:

1. Panel signs.

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: ADAAG.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Andco Industries, ASI Sign Systems, Supersine Co., Vomar Products or approved equal.

B. Panel Signs:

1. Type: Unframed.
2. Material: Injected Molded Plastic.
3. Copy: Applied die-cut vinyl lettering.
4. Size 8” x 10”.
5. Design: Manufacturers standard ADA symbol with text and braille, white graphics on black background.
6. Fasteners: Stainless steel vandal proof.

Provide and install the following required panel signs:

1. Restroom
2. Private

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install signs on entry doors or where directed by the Architect.

C. Restore damaged finishes. Clean and protect work from damage.

D. Install plastic signs and plaque on 5/4 cedar trim board on the exterior plywood with flashing at the board head.

END OF SECTION

SECTION 10522
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 SUMMARY

A. Provide fire extinguishers and brackets:

1. Fire extinguishers.
2. Provide two extinguishers.

1.02 SUBMITTALS

A. Submit for approval shop product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Standards: UL and FM listed products, NFPA 10.

C. Regulations: ADAAG.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufactures: J. L. Industries, Larsen’s Manufacturing, Potter-Roemer or approved equal.

B. Fire Extinguishers:

1. Type: Multipurpose dry chemical type.
2. Rating: “Larsen’s” MP10, 10lbs.UL 4A-60B:C With standard bracket 5525.
3. Mounting: Metal brackets.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fire extinguishers in mechanical and service areas with wall-hung brackets at locations and heights indicated and acceptable to authorities having jurisdiction.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

C. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 10800
TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide toilet accessories.
B. Mirrors are specified in another section.

1.02 SUBMITTALS

A. Submit for approval samples, shop drawings, product data.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

B. Regulations: ADAAG and local accessibility requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturers: Bobrick Washroom Equipment, Bradley Corp., GAMCO or approved equal.

B. Toilet Accessories:

1. Grab bars: At all handicap accessible showers and toilets Bobrick, #B-490,99 with interrupted slot head screws in the lengths and shapes indicated on the drawings. Mount centerline of grab bars at 34” above the floor.
2. Sanitary napkin disposal units. Rubbermaid RM-6140 12 ½” x 5 ¼” x 10 ¾“. Mount bottom of unit at 15” above the floor.
3. Robe hooks two per bathroom “Bobrick” B-672. Mount at 48” above the floor.
4. Toilet paper holder, one per toilet.
5. Paper towel dispenser, one per new bathroom.

C. Materials and Finishes:

1. Stainless Steel: AISI Type 316, No. 4 polished finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Install items shown on the drawings and as specified in this section. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

END OF SECTION

SECTION 11400
FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Kitchen stainless counters and shelfs are part of the Work.
B. Kitchen equipment not specifically indicated on the Drawings shall be provided and installed by the tenant.
C. Heat Lamps are part of the work of this section.

1.02 RELATED WORK

A. Related Sections include the following:

2. Division 15 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; refrigerant lines; atmospheric vents; valves, pipes, and fittings; and other materials required to complete kitchen equipment installation including final connections.
3. Division 16 Sections for connections to fire alarm systems, wiring, disconnect switches, and other electrical materials required to complete kitchen equipment installation including final connections.

1.03 REFERENCES

A. RI State Building Code.

1.04 SUBMITTALS

A. Refer to Division 1 for the submittals general requirements. The following paragraphs supplement the requirements of Division 1.
B. Shop Drawings of custom stainless steel counters and shelving.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms engaged in manufacture of food service equipment of types, capacities, and sizes specified, whose products have been in satisfactory service not less than 5 years.
B. Installer Qualifications: Kitchen Equipment Subcontractor with at least five (5) years installation experience with projects of a scope and size similar to that required for this Project.
C. Codes and Standards: comply with the following:

1. American Society of Testing and Materials (ASTM).
2. National Electrical Manufacturers Association (NEMA).
3. National Associations of Food Equipment Manufacturers (NAFEM).
4. SMACNA Standard: Fabricate food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines," unless otherwise indicated.
5. All equipment, accessories, and methods of installation shall be in accordance with OSHA (Occupational Safety and Health Administration) requirements.
6. Balance of codes and standards shall be as set forth elsewhere in these overall Specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Disconnect and remove from the building the existing kitchen equipment.
B. Store food service equipment to prevent damage from temperature, precipitation, and flooding; and in location to provide adequate protection while not interfering with other construction operations.
C. Install existing equipment back in original location after new floor is constructed.
D. Handle food service equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged food service equipment; replace and return damaged components to equipment manufacturer.

1.07 REQUIREMENTS AND RESTRICTIONS

A. Notify the General Contractor in writing of any walls, door bucks or conditions which should be left uncompleted until the entry of unusually large size equipment that would not normally pass through finished openings or door bucks.
B. Verify dimensions of equipment installation areas by field measurements before ordering equipment and shop fabrication of items. Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate field measurements on Shop and Coordination Drawings. Coordinate to ensure that actual dimensions correspond to established dimensions. Assume complete responsibility for accuracy.

1.08 COORDINATION

A. Coordinate equipment layout and installation with other work, including lighting fixtures, mechanical equipment, and fire-suppression system components.
B. Coordinate location and requirements of utility service connections.
C. Coordinate size, location, and requirements of the following: Overhead equipment supports; equipment bases; floor depressions; insulated floors; floor areas with positive slopes to drains; floor sinks and drains serving foodservice equipment; duct and equipment supports, and penetrations and all other items and accessories.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metals

1. Stainless-Steel: ASTM A240, type Type 316. Finishes: No. 8 polished.

2.02 FABRICATION

A. Acoustical Isolation

1. Sound deaden underside of metal work surfaces, including sinks, work tops, tables, drainboards, back counter and similar units with a coating of a NSF approved sound deadening material with an aluminum finish. Sound deadening shall be applied to fixtures after tops have been completely fabricated.
2. Hold coating back 3" from sanitary edges which are open for cleaning.

B. Structural Framing: minimum 1" pipe size or tube members, with mitered and welded joints and gusset plates ground smooth or 1½" x 1½" x 1/8" thick stainless steel angles for framing.

1. Provide 14 gauge stainless steel for framing.

C. Remove burrs from sheared edges of metal work, ease the corners and smooth to eliminate cutting hazard.

D. Welding shall be done with rod of same material and full penetration in the entire length of the joint. Welds shall be flat without buckles, voids or imperfections. All welds shall be ground flush with adjacent surfaces, conditioned to eliminate dangerous surfaces. All shear cuts or bends that tend to open the surface of the metal shall be rewelded, ground and polished. All edges are to be ground and filed to eliminate sharp or rough edges.

E. Edges and Backsplashes: Provide equipment edges and backsplashes indicated complying with referenced SMACNA standard, unless otherwise indicated.

F. Legs: $1^5/_8$" O.D. #16 gauge type 316 stainless steel tubing. Legs shall be fitted at top with fully enclosed stainless steel sanitary gussets welded to underside of tables, to reinforcing channels, and/or underside of sinks and at bottom with stainless steel adjustable flanges or bullet feet. Refer to the Drawings for additional legs required. The number of legs to be provided shall be four (4) for table length less than 72" and six (6) for table length ranging from 72" to 120", or as shown on the Drawings.

G. Feet shall be stainless steel adjustable bullet or flanged fully enclosed tightly fitting the leg. Provide 1" up and down adjustment from the central position without exposing any threads. Adjustments are to be easily made by hand without the use of tools. Where flanged feet are specified, provide stainless steel flanged feet, which can be securely fastened to floor with stainless steel bolts.

J. Counter: Top shall be constructed of 14-gauge, type 316 stainless steel with inverted “V” edges; 10” backsplash at rear and sides.
16 ga S/S adj. fixed bottom shelf; 14 ga S/S base-front and all exposed ends;

2.03 SHOP JOINTS

A. Shop joints shall be butt welded with joints ground smooth, presenting a uniform one-piece construction. Butt joints made by spot welding or riveting straps under seams filled with solder and then ground will not be acceptable.

2.04 HEAT LAMPS

A. Four (4) 4’-long heat lamps. Hatco #GRAH-48 or approved equal. 1100 watts each. Aluminum housing.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to all work, examine all areas prepared by others to receive Work of this Section. Notify other trades of unsatisfactory locations and dimensions of their work, and of unsatisfactory conditions for proper installation of the Food Service Equipment.
B. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected.
C. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

3.02 GENERAL

A. Solder shall not be used to fill in pits or crevices in stainless steel or to fill in the corners of same.

B. Finished Ends and Backs: Equipment, fixtures, splashes, shelves, and all other items and accessories shall have finished closed ends and backs of the same material and finish when exposed to view. Finished backs shall be made removable with concealed fastenings when enclosing area contains electrical or mechanical services or any other maintenance or repair requirements.

C. General Contractor shall leave openings for the entry of all equipment including unusually large size that would not normally pass through finished openings or door bucks and close the openings thereafter.

3.03 INSTALLATION

A. The installation and erection shall be performed under the supervision of the Kitchen Equipment Subcontractor and General Contractor.

B. Do not set food service equipment in place until after Quarry Tile floor has been washed.

C. Complete equipment assembly where field assembly is required.

1. Provide closed butt and contact joints that do not require filler.
2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish.

D. All methods of installing, mounting and securing equipment provided hereunder shall comply with applicable NSF standards.

E. Repair adjacent surfaces damaged by improper installation to the satisfaction of the Architect.

F. Set each item of nonmobile and nonportable equipment securely in place, level and adjust to correct height. Anchor to supporting structure where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorages where possible. Adjust counter tops and other work surfaces to level tolerance of 1/16" maximum offset, and maximum variation from level or indicated slope of 1/16" per foot. Where indicated, or required for safety of equipment operator, anchor equipment to floor or wall. Where equipment is indicated to be anchored to floor, provide legs with S/S adjustable bullet or flanged feet as specified.
Flanged feet shall be anchored to the floor using stainless steel bolts and anchors bolts or anchors. Predrill floor for installation of bolts or anchors. Waterproofing of the floor shall be maintained.

G. Cut-Outs: Provide cut-outs in food service equipment where required to run plumbing, electric or gas lines through equipment for final connections. All such penetrations shall be fitted with rubber grommets to protect these service lines.

H. Install all equipment level and plumb, according to manufacturer's written instructions and requirements of authorities having jurisdiction. The installation location must allow adequate clearances for servicing and proper operation.
Cooking equipment: Maintain a minimum of 6” clearance from unit’s control panel to any heat producing equipment.

I. Liquid soap and Single-fold paper towel dispensers must be installed above all hand sinks (Kitchen Lavatories) to meet DOH code.

J. General Contractor, Mechanical Subcontractor, Plumbing Subcontractor and Electrical Subcontractor to insure all equipment runs above finished ceiling do not interfere with any ceiling hung equipment.

3.04 PENETRATIONS

A. Where refrigeration lines and all other items and accessories pass through slabs or fire rated walls, the openings or sleeves through which these lines pass shall be sealed in an approved manner with an approved Fire Safety Material.

B. The sealing of such openings shall be made using self expanding fire retardant foam sealant as specified in Section 07270: Firestopping.

C. Utility Penetration: Each trade to provide penetration to accommodate their respective work. Provide sleeves and stainless steel escutcheon plates for each trade to dress off

utility penetrations. Each trade shall be responsible for cutting the hole, provide the sleeve and sealing of respective penetrations. Penetrations should be fire stopped when passing through fire rated construction.

3.05 ASSISTANCE AND INSPECTION

A. Provide assistance to the various trades in locating sleeves and conduits through which the utility lines are to be drawn and make necessary field inspections to check the location of sleeves and conduits and other conditions affecting the Food Service Equipment relative to the space on which each piece of equipment is to be located or its utility connections.

B. Field inspections for this purpose shall be made before finished floors are laid in order to make any necessary relocation of utility sleeves or conduits.

3.06 FIELD QUALITY CONTROL AND TESTING

A. Do not start-up the Food Service Equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and all other items, accessories and considerations; and until water lines have been cleaned and treated for sanitation. Before testing, lubricate each equipment in accordance with manufacturer's recommendations. Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are functioning.
Before demonstration of the equipment to the operating personnel, test through authorized service agencies, all mechanical and electrical equipment provided hereunder for operating efficiency and for conformance to all requirements herein specified.

B. Equipment shall be tested under operating conditions; where possible, all safety devices shall be tested under simulated emergency conditions.

C. Such testing shall include, but not be limited to:

1. All valves, regulators, gauges, safety devices and sensors.
2. Factory interwiring and/or piping connections.
3. Motor and pump rotations.
4. Calibration of all thermostats, thermometers, heat switches and temperature sensing controls.
5. All heating devices for hot spots and heating patterns.
6. Calibration of all refrigeration systems.
7. Pilot lights and gas pressures.
8. Gaskets seals on all pressure vessels.
9. Water level controls.

D. Provide necessary technicians, materials, and equipment required to conduct these tests.

3.07 CLEANING AND PROTECTING

A. When all the work by this Contract, together with the work of other trades has been completed, clean each and every item of equipment so that all traces of grease, stains, protective coatings, abrasive dusts, markings, scratches, and other foreign matter are completely removed. The cleaning process shall be one which shall eliminate any further cleaning on the part of the Owner with the exception of that which would ordinarily be undertaken daily to maintain accepted standards of sanitation and appearance.

B. After completing installation of equipment, clean and adjust equipment as required to produce ready-for-use condition. Protect equipment from damage during remainder of the construction period.

3.08 SPECIAL NOTES

A. Dimensions given are approximate only, and in all cases where equipment is intended to occupy fixed locations and spaces, the physical conditions of the building are to control the absolute sizes.

PART 4 - EQUIPMENT

4.01 PAPER TOWEL DISPENSER

A. Surface-mounted paper towel dispenser shall be fabricated of stainless steel with exposed surfaces in satin finish. Stainless steel: 22 gage (min.). Free of burrs and sharp edges. Tumbler lock to secure hinged cabinet.

Towel Capacity: 400 single-fold paper towels (minimum).

B. Manufacturers: Subject to compliance with specifications:

Bobrick Washroom Equipment Inc. Model B-263
Bradley Corporation Model 251-15.

END OF SECTION

SECTION 13333
LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. **All conductors are to be concealed in the wall and roof structure. No conductors shall be exposed to view. Run grounds as required down the piles concealed in plastic conduit. Any exposed conductors are not acceptable as they will be stolen by vandals.**

B. **There was an existing lightning protection system installed on the building that burned and has been demolished. The adjacent buildings have a lightening protection system. Install new system in the new building with new grounds and conductors. The completed project will have one lightning protection system that protects the completed facility.**

C. Provide a complete lightning protection system with UL certification.

D. The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Architect of any discrepancy before performing the work.

E. System Description: System shall consist of standard products of a manufacturer regularly engaged in the production of lightning protection products and has the manufacturers latest UL approved product. The lightning protection system shall conform to NFPA 70 and NFPA 78, UL 96 and UL 96A, except where requirements in excess thereof are specified herein.

1.02 REFERENCES

F. The publications listed below form a part of this specification to the extent referenced.

1. Federal Specifications: FS W-S-610 (rev.E) Splice Connectors.
2. Institute of electrical and electronics engineers, inc. (IEEE): IEEE Guide for measuring earth resistivity, ground impedance, and earth potentials of a ground system.
3. National Fire Protection Association (NFPA): NFPA 70 National Electrical Code, NFPA 78 Lightning Protection Code.
4. Underwriters Laboratories Inc. (UL): UL 03, UL 96, UL 96A, UL 467.

1.03 SUBMITTALS

A. Submit for approval product data, warranty, test reports, UL certification, maintenance data.

B. Shop Drawings:

1. Overall lightning protection system.
2. Installation Drawings that locate the specific location of equipment, mounting details, relationship to other parts of the work and wiring diagram.
3. Detail drawings of each major component to include manufacturers descriptive and technical literature, catalogue cuts and installation instructions.

C. Certificates:

1. Lightning inspection materials and equipment certification of compliance with UL requirements. This certification to be submitted after installation of system.

G. Field Test Reports:

1. Grounding system test.

2. Lightning protection system inspection.

1.04 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Do not use a combination of materials that forms an electrolytic couple of such nature that corrosion is accelerated in presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, provide conductors with protective coatings or oversize conductors. Where mechanical hazard is involved, increase conductor size to compensate fro hazard or protect conductors by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is used, electrically bond conductor to conduit or tubing at the upper and lower ends by clamp type connectors or welds (including exothermic).

B. Main Bonding Conductors: NFPA 78 and UL 96 Class 1, Class 1 1, or Class 1 1 modified materials as applicable.

C. Copper: Provide copper conductors on nonmetallic stacks that do not weigh less than 319 pounds per thousand feet, and provide cable such that the size of any strand in the cable is not less than No. 15 AWG. Provide thickness of web or ribbon on stacks that is not less than No. 12 AWG. Provide loop conductors that are comprised of copper conductors not smaller than 1/0 AWG.

D. Air Terminals: Provide terminals in accordance with UL 96, except provide Class 11 for Class I and Class 11 applications. Support air terminals more than 24 inches in length by suitable brace, with guides, not less than one-half the height of the terminal.

E. Ground Rods: Provide rods made of copper-clad steel conforming to UL 467. Provide ground rods that are not less than ¾ inch in diameter and 10 feet in length. Do not mix ground rods of copper-clad steel, stainless steel, galvanized ferrous, or solid copper on the job.

F. Grounding Plates: Copper-clad steel conforming to UL 96.

G. Connections and Terminations: Provide connectors for splicing conductors that conform to UL 96, class as applicable, and FS W-S-61 0, Class 2. Conductor connections can be made by clamps or welds (including exothermic). Provide style and size connectors as required for the installation.

H. Connector Fittings: End to end, Tee, or Y splices that conform to NFPA 78.

I. Provide bonding plates, air terminal supports, chimney bands, clips, and fasteners that conform to UL 96 classes as applicable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

C. **All conductors are to be concealed in the wall and roof structure. No conductors shall be exposed to view.**

D. Lightning protection system consists of air terminal, roof conductors, down conductors, ground connections, grounding electrodes and ground loop conductor. Electrically interconnect lightning protection system to form the shortest distance to ground. Do not use non conducting parts of the structure as part of the building's lightning protection system. Interconnect secondary conductors with grounded metallic parts within the building. Make sure interconnections within side-flash distances at or above the level of the grounded metallic parts.

E. Air terminal design and support shall be in accordance with NFPA 78. Rigidly connect terminals to, and make electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T shaped malleable metal. Provide pressure connector or crimped joint with a dowel or threaded fitting to connect ground rod conductor with air terminal. Set air terminal at ends of structures not more that 2 feet from ends or ridges and corners of roofs. Do not exceed 25 feet in spacing of 2 foot high air terminals on ridges, parapets, and around perimeter of building with flat roofs. When necessary to exceed this spacing, increase specified height of air terminal not less than 2 inches for each foot of increase over 25 feet. On large flat, or gently sloping roofs, as defined in NFPA 78, place air terminals at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 50 feet in length. Secure air terminals against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces which are permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings such as smokestacks and other metal objects that are at least 3/16" thick and that do not contain hazardous materials, need not be provided with air terminals. However, bond these metal objects to a lightning conductor through a metal conductor of the same weight per length as the main conductor. Where metal ventilators are installed, mount air terminals thereon, where practical. Bond air terminals, erected by necessity adjacent to a metal ventilator, to the ventilator near the top and bottom. Where nonmetallic spires, steeples, or ventilators are present, mount air terminals to the side. In addition, where spires or steeples project more than 10 feet above the building, continue conductor from air terminal to nearest down connector securely connected thereto.

F. Connect roof conductors directly to the roof or ridge roll. Avoid sharp bends or turns in conductors. Do not make turns of less than 8 inches. Preserve horizontal or downward course on conductors. Rigidly fasten conductors every 3 feet along the roof and down the building to the ground. Rigidly connect metal ventilators to the roof conductor at three places. Make connections electrically continuous. Course roof conductors along contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to the rest. Connect roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.

G. Down conductors shall be electrically continuous from air terminals and roof conductors to grounding electrodes. Course down conductors over outer extreme portions of the building, such as corners, with consideration given to location of ground connections and air terminals. Each building or structure shall have not less than two down conductors located as widely separated as practical, such as at diagonally opposite corners. Install additional down conductors when necessary to avoid "dead ends" or branch conductors exceeding 16 feet in length, ending at air terminals. Equally and symmetrically space down conductors about the perimeter of the structure. Protect conductors where necessary to prevent physical damage or displacement to the conductor.

H. Connect metal doors and windows, directly to the grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent.

I. Securely connect conductor forming continuations of down conductors from structure to grounding electrode in a manner to ensure electrical continuity between the two. Provide clamp type connections or welds for continuation. Provide a ground connection for each down conductor. Attach down conductors to ground rods by welding, brazing, or clamping. Provide clamps suitable for direct burial. Protect connection from mechanical injury. Bond metal water pipes and other large underground metallic objects together with all grounding mediums. In making ground connections, take advantage of all permanently moist places where practical.Provide grounding electrode for each down conductor. Extend driven ground rods into the existing undisturbed earth for a distance of not less than 10 feet. Set ground rods less than 2 feet, nor more than 10 feet, from the structure. After the completed installation, measure the total resistance to ground using the fall of potential method described in IEEE 81. Maximum resistance of a driven ground rod will be 10 ohms, or less, under normally dry conditions. Use a ground loop when two of any three ground rods, driven not less than 10 feet into the ground, a minimum of 10 feet apart, and equally spaced around the perimeter, give a combined value exceeding 50 ohms immediately after having driven. For ground loop, provide continuous No. 1/0 bare stranded copper cable or equivalent material having suitable resistance to corrosion. Lay ground loop around the perimeter of the structure in a trench not less than 30 inches below grade, at a distance not less than 2 feet nor more than 10 feet from the nearest point of the structure. Install a ground loop in earth undisturbed by excavation, not earth fill, and do not locate beneath roof overhang, or wholly under paved areas or roadways where rainfall cannot penetrate to keep soil moist in the vicinity of the cable. Make connections between ground conductors and grounds or ground loop, and between ground loop and grounds electrically continuous. Where required, provide an alternate method for grounding electrodes in shallow soil by digging trenches radially from the building. Provide 1/0 bare copper arranged in a star pattern with the structure at the center for radial systems. Bury the radials at least 30 inches below grade external to the structure. Lower ends of down conductors are buried in trenches.

3.02 INTERFACE WITH OTHER STRUCTURES

A. Protect metal bodies of conductance when not within the zone of protection of air terminal. Bond metal bodies of conductance having an area of 400 square inches or greater or a volume of 1000 cubic inches or greater to lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 3 square inches. Make provisions to guard against the corrosive effect of bonding dissimilar metals. Bond metal bodies of inductance at their closest point to the lightning protection system using bonding conductors and fittings. Independently ground any metal body that exceeds 5 feet in any dimension, that is wholly within the building, and does not at any point come within 6 feet of a lightning conductor or metal connected to lightning protection system.

3.03 FIELD QUALITY CONTROL

A. Test the grounding system to ensure continuity, and that resistance to ground is not in excess of 10 ohms. Test the ground rods for resistance to ground before making connections to the rod. Tie the grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Include in the written report: Location of ground rods, resistance, and soil conditions at the time that the measurements were made. The Contractor shall notify the Architect five days prior to performing tests. Submit results of each test to the Architect.

B. Make visual inspections to verify that there are no loose connections which may result in high resistance joints, and that conductors and system components are securely fastened to their mounting surfaces and area protected against accidental mechanical displacement as required.

END OF SECTION

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SECTION 230000
MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, provisions of the Contract, and Division 01 Specification Sections, apply fully to work in this section.

B. All requirements of this Section shall govern the work under all of the Sections of Division 23 - Mechanical including:

Section 23 00 50	**MECHANICAL: ELECTRICAL COMPONENTS**
Section 23 01 50	**MECHANICAL: VIBRATION ISOLATION**
Section 23 02 50	**MECHANICAL: PIPE HANGERS AND SUPPORTS**
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Section 23 85 00	**HVAC: EQUIPMENT**
Section 23 95 00	**HVAC: TESTING ADJUSTING BALANCING**

1.02 DEFINITIONS:

A. The term "Mechanical" applies and refers to all work specified within Division 23 and as indicated on the Contract Drawings.

B. The term "Mechanical Contractor(s)" applies and refers to all those furnishing labor and materials for the completion of the work specified within Division 23 and as indicated on the Contract Drawings. All subcontractors and sub-subcontractors, as defined within the General Conditions, are collectively termed "Mechanical Contractor(s)". The requirements of Section 23 00 00 apply to all Mechanical Contractor(s).

C. The term "this Section" shall mean "this Section of the Specifications". The term "this Division" shall refer to "Division 23 - Mechanical" and all of its Sections.

D. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

E. "Concealed" shall mean hidden from sight in trenches, chases, furred spaces, shafts, above hung ceilings, embedded in construction, in attic spaces or in crawl spaces.

F. "Work by others" shall mean "not by Mechanical Contractor but provided or installed by the General Contractor or any other sub-contractor performing their respective work within this contract".

1.03 INTENT:

A. The intention of these Specifications and Drawings is to call for finished work, tested and ready for operation.

B. The drawings are diagrammatic and not intended to show every pipe, offset, associated equipment or other minor detail. Provide such parts, materials, and appliances as required to complete the systems for operation.

C. Equipment and/or materials specified in the singular shall be provided in quantities as required for complete systems.

1.04 EXISTING CONDITIONS:

A. Prior to submitting a bid, visit the site, become familiar with the existing conditions, with the contract work of all trades, and become fully knowledgeable of how it relates to this Division.

1.05 PROJECT MEETINGS:

A. Provide knowledgeable personnel to attend meetings scheduled (Include all trades) as required.

1.06 COORDINATION / COOPERATION:

A. Cooperate with all other tradesmen, Contractors and Subcontractors to facilitate the completion of the work as a whole, as indicated on the drawings and specifications.

B. Wherever work interconnects with the work of other Contractors, coordinate the work with these Contractors to insure that all information is available such that all equipment and material may be installed properly with all necessary connections and appurtenances.

C. Coordinate the location of all openings required for apparatus and transmit this information sufficiently in advance, so that all openings in walls, slabs, roofs, piping supports, inserts and equipment including sleeves and access doors may be properly installed.

D. Where work will be installed in close proximity to, or interfere with the work of other trades, assist in coordinating space conditions to a satisfactory adjustment. If directed by the Architect, provide composite working drawings indicating the proposed adjustment.

E. All distribution systems which require pitch or slope such as plumbing drains and condensate drain piping shall have the right of way over those systems which do not require pitch. Where the work to be installed is located by detail and or elevation, that work shall have the right of way over items indicated as schematic or without indicated location (electrical conduits, control conduits etc). Confer, coordinate and cooperate with other trades as to the location of pipes, lights, and apparatus and install all work to avoid conflict and interference.

F. Work that is installed to interfere with the work of others prior to proper coordination and cooperation, shall be adjusted to correct the situation without extra compensation.

1.07 DELAYS:

A. Become fully informed as to availability dates of materials and equipment to be provided. Where availability dates interfere with the progress of the work or the Sequence of Operations, notify the Architect and transmit all recommendations, including any changes in costs, to remedy the situation.

B. Final decisions as to the procedure in cases of delays, strikes, and acts of God shall be in writing by the Architect. **DO NOT alter work, materials or equipment without written authority by the Architect.**

C. Order equipment and materials in advance of the time of installation to avoid project delays.

1.08 WORKMANSHIP:

A. Workmanship shall be of the highest quality, in the best practice of the trade, and none but competent mechanics skilled in their respective trades shall be employed. Materials and apparatus shall be provided, delivered, erected, connected, and finished in every detail; and shall be so selected and arranged as to fit properly into building spaces.

1.09 DRAWINGS:

A. Refer to all Contract Drawings for a full comprehension of the extent and detail of the work. Drawings are supplementary to the specification and work indicated, mentioned or implied in either is considered as specified by both.

B. Work indicated on the drawings is intended to be approximately correct to scale, but dimensions and details are to assume precedence.

C. Typical details apply to every like item. They are not repeated in full on all of the drawings, which are diagrammatic only, but with the intention that such typical details are fully applicable.

1.10 INTERPRETATION OF PLANS AND SPECIFICATIONS:

A. The Architect, whose interpretation shall be final, conclusive and binding on all parties, shall decide questions or disagreements as to the true intent of this specification and drawings.

1.11 CODES, ORDINANCES, AGENCIES:

A. The State Building Code, Fire Code and local ordinances, with all amendments to date, are hereby made a part of these specifications. Work shall conform to State Codes and Regulations.

B. The codes and ordinances shall be considered as a minimum requirement, and work specified or indicated on the drawings in excess of code requirements shall be provided.

C. Notify authorities and agencies; obtain all permits; obtain all official licenses and certificates; obtain all necessary approvals of authorities having jurisdiction; file all necessary plans; perform all necessary testing; and transmit to the Architect all certificates of inspection.

D. Materials provided and work installed shall comply with the National Fire Codes of the NFPA; with the requirements of local utility companies; and with the requirements of agencies having jurisdiction.

E. Electrical materials and equipment shall be U.L. approved or listed. All electrical equipment shall be in compliance with the Energy Conservation Code and shall meet or exceed all operating energy efficiency requirements.

1.12 FEES, PERMITS:

A. Include the following costs within the bid amount;

The payment of all fees in connection with obtaining necessary permits, licenses, and inspections.

Note: All contractors and subcontractors must file for permits

The costs of all utility connections and extensions, to include the purchasing of meter(s) and appurtenances.

The payment of applicable taxes.

PART 2 - SUBMITTAL GENERAL REQUIREMENTS

2.01 SUBSTITUTIONS, CONTRACTOR'S OPTIONS:

A. See Supplementary Conditions of the Contract for Construction.

B. Where only one product is specified, and the intention is to match existing equipment or materials within the mechanical system, the contractor shall submit his base bid on the product specified.

C. Where only one product is specified, but is followed by the phrase "or approved equal" the Mechanical Contractor(s) must submit his base bid on the product specified. Proposed substitutions for equivalent products shall be submitted for review under SUBSTITUTION PROPOSALS.

D. Where two or more products are specified for one use, the Mechanical Contractor(s) shall select from those products mentioned. Where specific model of one manufacturer is specified and other manufacturers are listed, the products of listed manufacturers must be equal in all major respect.

It remains the responsibility of the Mechanical Contractor to review the dimensions, weights, required clearances, required supporting structure, etc. of the equipment of "other" manufacturer's relative to the proposed use. The Mechanical Contractor is responsible for any changes to the design and to the building fabric (i.e. supporting structure, mechanical spaces, piping or ductwork connections and routing, etc.) resulting from the use of equipment of the "other" manufacturers.

No proposal for extra charges resulting from the use of equipment of the "other" manufacturers will be entertained for approval.

E. Where products are specified by reference standard, select any product that meets the standards by any reputable manufacturer.

2.02 SUBSTITUTION PROPOSALS:

A. Refer to the Schedule of Submissions for the time period allowed for submission of substitution proposals. The proposal shall state the exact products proposed for substitution and include a cost difference in total savings to the Owner for each proposal.

B. Include in the proposal complete engineering data, shop drawings, samples and state whether related changes in the project are involved if the proposal is accepted.

C. No substitutions of products, materials or methods are permitted without written authority by the Architect.

D. Where no substitution proposal is made within the specified time period, products, materials and equipment shall be submitted and installed as specified.

E. See Division 01 Specification Sections: Review additional requirements for substitutions.

2.03 SUBMISSIONS:

A. Refer to the SCHEDULE OF SUBMISSIONS below. Also refer to SUBMITTALS within other Sections of Division 23 in which some of the shop drawings to be submitted are listed. The listing is a minimum listing only. Submit lists of products and subcontractors; detailed drawings, catalog data of all products, equipment and materials required to complete the project and no item shall be ordered, delivered or installed until the reviewed shop drawing submittal is in the possession of the installing contractor.

2.04 SCHEDULE OF SUBMISSIONS:

ITEM	TIME PERIOD	COPIES
LIST OF SUBCONTRACTORS	10 days	7
LIST OF MANUFACTURERS/PRODUCTS	15 days	7
SUBSTITUTION PROPOSALS	20 days	7
SHOP DRAWINGS	25 days	7

Note: The time period above is based on the number of working days after the signing of the contract.

2.05 LIST OF SUBCONTRACTORS:

A. Submit a complete LIST OF SUBCONTRACTORS proposed for use; including complete firm names, address, and phone numbers.

2.06 LIST OF MANUFACTURERS / PRODUCTS:

A. Submit a complete LIST OF MANUFACTURERS of materials and equipment specified within this section proposed for use; including materials and equipment proposed by all subcontractors. **Partial lists will not be accepted**.

2.07 SHOP DRAWINGS:

A. Provide shop drawings (drawings, catalog cuts, spec sheets) for ALL equipment and products to be installed on the project.

B. Label all shop drawing submittals as follows:

Project Name
Contractor's Name
Specification paragraph

C. Mark in ink all catalog cuts, pamphlets to indicate options, accessories and model numbers.

D. Data submitted which is general and not labeled and marked as required above will not be accepted.

2.08 SHOP DRAWING REVIEW:

A. Review will be based on manufacturer's published data, and ratings. Any product, material or equipment submitted not in accordance with these specifications will be rejected.

B. Where substitute products are proposed and no exception is taken, the Mechanical Contractor shall assume the entire responsibility for any changes in the work required or occasioned by the use of the substitute.

C. Review of shop drawings is not a guarantee of suitable measurements, quantities required, or that other changes in the work are not required to permit proper installation. Review does not mean the submittal has been checked for every detail, or that the Contractor is relieved from responsibility of providing complete systems as required by the Contract Documents.

2.09 RECORD DRAWINGS:

A. During the period of on site construction, keep at the site, separate from construction documents, accurate construction drawings marked to indicate actual installation of all work of all of the trades specified within Division 23. Drawings shall reflect addenda, change orders, VE items or substitutions accepted for the project. Drawings shall be “red lined” with all modifications on a weekly basis.

All underslab, concealed or underground piping shall be located by dimension sufficient for exact location determination in the future.

All concealed work shall be accurately located and all points of adjustment (dampers etc) shall be shown in actual locations.

B. Final **Record Drawings** shall be prepared by the Mechanical Contractor on a set of reproducible drawings which accurately indicate all of the work as installed.

All adjustable setpoints shall be indicated on the drawings at the device sensor or point of adjustment.

C. Transmit originals and two sets of prints for review at project closeout.

D. At project closeout transmit final Record Drawings in electronic format indicated below

AutoCad dwg files
PDF files

2.10 OPERATING AND MAINTENANCE MANUALS:

A. Compile complete manuals including manufacturer's data, bulletins, maintenance instructions, approved shop drawings, parts lists, warranties etc for all equipment and materials provided.

Equipment data shall include:

Manufacturer / Models
Input and output capacities
Service and maintenance recommended actions
Manufacturers published instructions

Operations written narrative:

Include a complete written narrative of how each system and component is intended to operate.

B. Assemble and index three copies of each manual within suitable binders (8 ½" x 11"). Provide cover clearly indicating project title and "OPERATION AND MAINTENANCE MANUAL".

C. Transmit manuals to the Architect for review in advance of scheduled instruction periods.

2.11 GUARANTEE:

A. Transmit to the Architect a written guarantee from each of the Mechanical Contractors stating that the work provided under these specifications is guaranteed against defects in material and workmanship which shall become apparent during the period of one (1) year from acceptance of the systems.

The written guarantee shall list all contractors with contact names and phone numbers, and shall indicate the dates of acceptance of systems and any extended warrantees.

The written guarantee shall be posted as directed by the Architect

B. Extended guarantee or warrantee of certain equipment may be required. See specification of individual items.

PART 3 - PRODUCT HANDLING

3.01 PROTECTION AND STORAGE OF MATERIALS:

A. Equipment and materials furnished shall, at all times, be protected from weather, vandalism, and other construction phase exposures to include paint, plaster and dust.

B. Outdoor storage of equipment not intended for outdoor use will NOT be permitted.

C. Properly protect all pipe openings with temporary caps to prevent obstruction and damage. Post notices and prohibit use of fixtures, equipment and apparatus prior to the completion of the project.

3.02 RIGGING, HOISTING, STAGING:

A. Furnish rigging, hoisting equipment, staging and other services necessary for delivery and installation of any product provided. Remove rigging, staging from the site when no longer required.

PART 4 - PROJECT CONDITIONS

4.01 FIELD MEASUREMENTS AND DISCREPANCIES:

A. Base all measurements, both horizontal and vertical, from referenced points established by the General Contractor.

B. Prior to the start of work, check drawings and specifications for discrepancies.

C. Field verify spaces, dimensions and clearances where materials and equipment will be installed.

D. Where discrepancies arise which prevent or alter installation, notify the Architect.

E. Where discrepancies between drawings and specifications; between different drawings; or where the work of others is affecting work under this Division notify the Architect.

F. Where the work herein required is not clearly understood apply to the Architect for further clarification.

G. In each instance above, the Architect shall clarify the discrepancy and the Mechanical Contractor(s) shall complete the work at no additional cost to the Owner.

4.02 ACCESSIBILITY:

A. Install work so that parts requiring access are readily accessible for inspection, operation, maintenance, repair and removal. Minor deviations from the drawings may be made to accomplish this, but changes of magnitude shall not be made without written approval of the Architect.

4.03 TEMPORARY OPENINGS:

A. Examine contract documents and ascertain whether special, temporary openings will be required for the installation of apparatus and notify the Architect.

4.04 SOLDERING, BRAZING, WELDING:

A. Soldering, brazing, welding or other open flame operation shall be conducted only when a person, with approved firefighting equipment, trained in its use is on duty at the location of the operation.

4.05 INTERRUPTIONS TO SERVICES:

A. Where a temporary shutdown of an existing operating system is required, schedule the work at times designated by the Architect. Work requiring an interruption shall be completed by continuous performance, including overtime, to minimize the shutdown interruption.

4.06 USE OF INSTALLATION BY OWNER:

A. The Owner may use parts of the installation, including mechanical systems when complete, but such use shall not be considered as acceptance of the work in lieu of written certificate from the Architect.

B. Schedule obnoxious, noisy, or otherwise objectionable portions of the work at times approved by the Architect. Overtime work must be approved in writing.

PART 5 - PRODUCTS AND INSTALLATION

5.01 MATERIALS:

A. Provide new, first-class quality materials and apparatus, unless specifically directed otherwise by this specification or contract drawings.

5.02 ON-SITE INSPECTIONS

A. Arrange for and coordinate all on-site inspections with the authorities having jurisdiction.

B. Review project schedules and insure that such inspections as are necessary are completed in a timely manner.

5.03 MANUFACTURER'S RECOMMENDATIONS, IDENTIFICATION:

A. Obtain necessary data on equipment and materials to insure proper installation and testing in accordance with manufacturers' recommendations. Install all equipment and material per the recommendations and instructions of the manufacturer; this requirement shall take precedence over other requirements of this specification unless specifically noted.

B. Equipment and materials furnished for this work shall bear the manufacturers' nameplate, trademark or suitable identification permanently affixed. The nameplate of a contractor or distributor is not acceptable.

5.04 COLOR SELECTION; MATERIALS / EQUIPMENT:

A. Exterior: Provide metal louvers, grilles, fans, intake units, etc of equal coloration as indicated for exterior metal trim for the project. All exterior metal trim shall match.

B. Interior: Product color shall be selected by the Architect. Provide complete color selection charts, chips with product submittals. Equipment to be painted shall have prime coat, anti-rust as necessary, factory applied.

5.05 QUIET OPERATION:

A. Equipment and apparatus provided shall operate under all conditions of load without sound or vibration which are considered objectionable by the Architect. Eliminate same in a manner approved by the Architect.

5.06 ELIMINATION OF TRANSMISSION OF VIBRATION:

A. Eliminate objectionable transmission of vibration from mechanical systems to building structure. Select and install equipment with proper vibration control equipment and provide isolators on piping, equipment, ductwork and apparatus where necessary to prevent transmission of sound and vibration. Isolate all rotating equipment from the building structure.

5.07 BASES AND SUPPORTS:

A. Provide all bases and supports for mechanical equipment not part of the building structure of required size, type and strength, as approved by the Architect.

B. Equipment, bases, and supports shall be anchored to the building structure to prevent shifting of position under all conditions. Attachments shall be strong and of a durable nature and any attachments, anchors, piers, bases, or other supports that are, in the opinion of the Architect, not strong enough or durable shall be replaced as directed.

5.08 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS:

A. Provide steel members, channels as required for the proper installation, mounting and support of equipment provided. Pipe shall not be allowed for use as miscellaneous steel supports. All steel used for support shall be firmly attached to the building construction.

B. Size and type of supporting steel shall be determined by the installer and shall be of sufficient strength and size to allow only a minimum deflection under all conditions of load.

C. All steel provided for support shall be free from rust and shall be primed with antirust paint or shall be galvanized. All exterior steel shall be galvanized.

5.09 SLEEVES, PLATES:

A. Provide and locate sleeves, plates, anchors, and inserts required; mark openings before floors and walls are constructed or core bored.

B. Provide sleeves for piping passing through floors, walls, roofs, partitions and masonry. Sleeves for concrete or masonry shall be Schedule 40 steel pipe of size to allow for pipe expansion and passage of vapor barrier insulation. Other sleeves shall be 20 gauge galvanized sheet steel with lockseam joint.

   Terminate sleeves flush with walls, partitions, and ceiling.
   Terminate sleeves 1/2" above finished floor where piping is exposed.

C. Provide support systems such that access to equipment or appurtenances requiring access are not impeded in any way.

5.10 PIPE ESCUTCHEONS:

A. Provide escutcheons for pipe penetrations of building construction exposed to view.

B. Escutcheons shall closely fit bare or insulated pipe and shall conceal pipe sleeves.

C. Escutcheons in unfinished areas shall be of solid or split pattern steel, cast iron or malleable iron.

D. Escutcheons in finished areas shall be of chrome plated, solid pattern brass.

5.11 FIRE SAFING: PIPING, DUCTWORK AND EQUIPMENT OPENINGS:

A. Fire Stop: Pack all piping, ductwork and equipment openings and sleeves full depth with approved fire safing material to fully seal all openings.

B. Seal all sleeves, core holes, etc. through floors, walls and ceilings with approved fire safing material or fire safing system. Fire safing materials and systems shall be as manufactured by Nelson “Flame-seal”, 3-M Systems, Hilti Systems, Metacaulk Firestopping or Dow Corning. Install in accordance with manufacturer’s printed instructions.

C. Firestopping is to meet UL ratings for each penetration type and material for floors, walls and ceilings. Coordinate with Architectural Drawings for exact requirements and ratings at various conditions.

D. Refer to Section 23 03 00 Mechanical Fire Safing for Specific fire safing requirements.

5.12 MACHINERY DRIVES:

A. V-belt drives shall be designed to transmit safely equal to or greater than 150% of motor horsepower rating, but not less than manufacturer's recommendation for type of service intended.

5.13 PROTECTIVE GUARDS:

A. Provide protective guards at all belt drives, rotating shafts and rotating equipment. If not a part of equipment, guards shall be of galvanized angle frame with galvanized wire mesh, readily removable for service.

5.14 PORTABLE OR DETACHABLE PARTS:

A. Retain and be responsible for all portable or detachable parts provided as a part of the work. Install these parts just prior to project closeout when the site is secure. Replace all lost, stolen or damaged items prior to project acceptance.

5.15 LABELS, VALVE TAGS, PIPE, DUCTWORK, AND EQUIPMENT IDENTIFICATION:

A. General:

All new systems provided as a part of the contract are to be labeled in a manner that conforms to the following specification. All existing systems, at points of new connection or reconfiguration, shall also be labeled in accordance with the following standards.

All labels, unless otherwise directed, shall be made of hard black plastic. Lettering shall be affected by engraving or incising, and shall be white. All labels shall be securely mechanically attached with screws or equal. Letters and numbers shall be at least 1/4” high, or larger, if required to read clearly from a normal viewing distance. All labels must be made to withstand the temperatures and atmosphere in the area they are to be mounted. Any labels which are to be

mounted outdoors must be treated to prevent degradation from sunlight, and must be mounted with stainless steel screws.

Where air or hydronic systems have been balanced, the Contractor shall permanently mark, ON THE DEVICE, the correct balancing setting of each damper, or similar device. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

All Mechanical Systems to be labeled in accordance with these requirements include, but are not specifically limited to, the following: Additional, specific items may require to be labeled as directed separately in other sections of this specification package.

B. Pipe Labeling:

Labels for piping shall be Seton Setmark or equal. Labels to identify zone number may be self-stick type, but must wrap completely around pipe, and be adhered to itself. All self-stick labels must be plasticized to withstand washing with commercially available cleaning products.

Piping labels shall be placed over any insulation on the pipe installed. Stenciling on the insulation jacket is not permitted, except as noted above.

For piping outside of Mechanical spaces; labels shall be placed every 40 linear feet of pipe. For piping within Mechanical spaces, labels shall be every 20 feet or as needed to provide clear and concise identification from the floor.

Label must show:

Fluid contained and service
Flow direction
Pressure (i.e. 50 psi)

Pipe Marker Lettering:

Outside Diameter of Pipe Covering	Required Size of Lettering	Tag Length
¾” to 1-1/4”	½”	8”
1-1/2” to 2”	¾”	8”
2-1/2” to 6”	1-1/4”	12”

Pipe Marker Color Standards:

Pipe Line Type	Description	Background Color	Lettering Color
Gas	LP Gas	Green	White
Water	Hot Potable Water	Yellow	Black
	Cold Potable Water	Green	White
Waste	Sanitary Waste	Green	White
	Sanitary Vent	Green	White

C. Valve Tagging:

Labels for valves shall be hard plastic and shall be no smaller than 2” in diameter.

Tags shall have the valve number incised or recessed into the plastic. The tag background and tag lettering shall conform to the color scheme as defined by this standard.

All valve labels shall be permanently attached with steel or brass jack chain, tags shall be color coded to correspond to the following color chart, if product is not listed, consult the Architect/Engineer.

Balancing Valves shall also be provided with tags, permanently marked, with the correct balancing setting. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

All valve labels must show a number that corresponds to a clearly posted valve legend.

Valve Tag Color Standards:

Pipe Line Type	Description	Background Color	Lettering Color
Gas	LP Gas	Yellow	Black
Water	Hot Potable Water	Yellow	Black
	Cold Potable Water	Green	White

D. Equipment:

All pieces of equipment shall be labeled with hard plastic, black plate labels. Lettering shall be white and must be made by engraving or incising the plate.

Any unit which is designed to move volume air shall be appropriately labeled. The hard plastic plate shall show brand; model; system number and function; areas served; design CEM; type of sheave; voltage and phase of service; HP and frame of motor; number and size of belts.

EXAMPLE: UNIT NUMBER: EF 1-1
Greenheck Model X
KITCHEN HOOD EXHAUST / 3,500 CFM
ADJ Shv - *5* HP - 208/3
FRM - (3) 4L190 BELTS

Show unit number as stated on the Drawings.
HVAC unit tags shall also state unit service or function.

E. Ductwork: Main Trunks, Main Branches Only:

Labels on ductwork shall be Seton Ventmark or equal. Each label shall show the required information as shown above. Labels shall be mounted over covering on the duct. The label must be mechanically attached. Adhesive backing alone is not acceptable.

Ducts shall be labeled every 30 linear feet of duct. Each duct branch shall be labeled with rooms and areas served.

Show number of system and identify what is carried within. Exhaust Air, Conditioned Air, etc. Ductwork tags shall also state branch's service or function.

F. Ductwork Accessories:

Show, AT THE DEVICE OR ACCESSORY LOCATION, tags indicating the type of device or accessory located within the ductwork. (i.e. dampers; eliminators; access panels; filter racks; water coils; etc.)

Where systems have been balanced, the Contractor shall permanently mark ON THE DEVICE the correct balancing setting of each damper, or similar device. This will allow our skilled tradesmen to restore proper operation if the device is tampered with.

G. Electric Motor Starters/Variable Frequency Drives:

Show equipment controlled; Primary and control voltage and phase located within.

H. Control Devices:

Show, AT THE LOCATION OF THE DEVICE, tags indicating the type of device or accessory, i.e. control switch; etc. Identify device function.

I. Automatic Control Systems Electrical Conduits:

Labeling for conduit shall be factory-made. Painting or stenciling is not acceptable. Lettering shall include the highest voltage carried within, and shall identify phase. Labeling shall repeat every 30 linear feet. Adhesive backed labels are acceptable here provided the label wraps around the entire circumference of the conduit, and adheres to itself. Otherwise, mechanical fastening with strap is required.

J. Contractor's Warranty Plate:

Must show the name, address, and telephone number of the contractor who completes the installation, and the date of final acceptance of the installation. THIS DATE WILL BE PROVIDED BY THE OWNER.

K. Equipment and Systems Concealed above Suspended Ceilings:

Where valves, equipment, electric motor starters or other items subject to routine service are mounted in a concealed area above an opaque ceiling, the ceiling must be marked with an engraved plastic disc directly under the serviced device. The disc shall carry appropriate nomenclature that corresponds to a clearly posted legend. The legend shall be counted in the mechanical room. Use Seton or equal with push-in tack backing.

L. Access Panels:

On each access panel or door, clearly label the door with a legend description of what is behind the door.

PART 6 - PROJECT CLOSEOUT

6.01 TESTING AND ADJUSTING:

A. Where testing leaks develop or the installation fails to function properly, make all necessary corrections and repeat tests until all defects have been remedied. Corrections made shall be to the satisfaction of the Architect prior to the acceptance of the work.

B. Furnish labor, material, and instruments necessary for those tests required. See respective Sections for test requirements.

C. In addition to required tests specified, provide qualified personnel to adjust all parts of systems such that proper, economical operation is achieved.

D. Conduct and be responsible for all testing and adjusting of all complete systems to include providing all labor and equipment required and the submission of all reports. Systems shall be operated, tested and adjusted in all modes of operation.

E. All defects and deficiencies or failing to operate properly shall be corrected by the Contractor and the systems shall be re-tested or readjusted prior to final acceptance.

F. Any and all damage caused by tests shall be the responsibility of the Contractor.

G. The balancing of the air conditioning systems shall be performed by an independent balancing contractor.

SEE SECTION 23 95 00 TESTING AND BALANCING.

6.02 OPERATION, MAINTENANCE INSTRUCTIONS:

A. Schedule and conduct, after the mechanical -- electrical systems are complete and operational, instruction periods for Owner's personnel. Operation and Maintenance Manuals shall be distributed to the Owner in advance of scheduled instruction periods.

B. Instruction periods shall include:

Normal and emergency start up and shut down of all systems
Normal maintenance requirements for all systems and equipment
Maintenance tasks and schedules for proper operation.
Review of Operations and Maintenance Manuals
Review of AS BUILT drawings

C. In addition to instruction periods; a thorough project walk through shall be conducted and the location and access to all points of operation, control and maintenance shall be indicated and noted.

D. At the completion of instruction periods forward a letter (5 copies) stating the names of those giving and receiving instructions.

6.03 LUBRICATION:

A. Lubricate, as required, all motors, bearings, fans, etc. before operation of any equipment. Provide a final lubrication when system is accepted by Owner.

6.04 CLEANING:

A. At completion, thoroughly clean all parts of the installation. Equipment, materials and apparatus shall be free of grease, paint, plaster and debris. Any damage to the building due to leakage or by other means shall be properly and immediately cleaned and repaired to the satisfaction of the Architect.

B. At completion, replace, clean, such parts of systems as filters, strainers, and traps. This work shall be done after site is substantially free of dust.

6.05 SCRATCHES, SCRAPES, DENTS:

A. Repair and correct, to the satisfaction of the Architect, all minor equipment deficiencies such as scratches, scrapes, dents; where corrective methods are not satisfactory, replace the item.

6.06 PROJECT CLOSEOUT SUBMITTALS:

A. Review all project closeout submittal requirements of this specification and transmit in a timely manner.

B. Provide all required items including (but not limited to):

Record As Built Drawings
Written Guarantee including any extended warrantees
Operating / Maintenance Instructions Memorandum
Testing / Adjusting Logs

6.07 SERVICE:

A. At completion, provide the Architect with a complete listing of all service contractors including 24-hour phone numbers.

B. Provide service on equipment furnished for a period of one year from the date of final acceptance. Render service promptly at the request of the Owner. This shall not be construed to include routine maintenance.

END OF SECTION 23 00 00

SECTION 23 00 40
MECHANICAL: DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and Section 23 00 00 Mechanical General Requirements, and the following listed sections as a minimum, apply fully to work in this section.

B. Refer to all Section 23 00 00 Mechanical General Requirements and coordinate all work with the work of the following listed Sections.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50	MECHANICAL: ELECTRICAL COMPONENTS
Section 23 10 00	PLUMBING
Section 23 85 00	HVAC: EQUIPMENT

1.02 DESCRIPTION OF WORK

A. Provide removal, relocation, rerouting and reconnecting of existing mechanical facilities, as shown and as required by contract documents, to accomplish alteration, restoration and to accommodate new construction.

B. Including but not limited to the following:

Demolition and removal of selected parts of mechanical systems.

Removal of debris and materials from the project site

Salvage of existing items and delivery to Owner.

C. All demolished materials and equipment are to be removed from the site and disposed of in an approved manner. Recycle materials where required.

1.03 QUALITY ASSURANCE

A. Reference Standards - Comply with the following:

American National Standards Institute (ANSI): Safety Requirements for Demolition - ANSI A 10.6.

National Fire Protection Association (NFPA): Safeguarding Building Construction and Demolition Operations - NFPA 241.

US Environmental Protection Agency (EPA)

The Federal Register - Emissions Standards for Hazardous Air Pollutants - 40 CFR-81.

Local city and state safety regulations including transportation and disposal regulations.

1.04 DEFINITIONS:

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

B. Salvage in first paragraph below may add cost to Project; verify with Owner.

C. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

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

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

1.05 PREDEMOLITION CONFERENCE:

A. Predemolition Conference: Conduct conference at Project site.

B. Review methods and procedures related to selective demolition including, but not limited to, the following:

Inspect and discuss condition of construction to be selectively demolished.

Review structural load limitations of existing structure.

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

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

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

1.06 SUBMITTALS:

A. Schedule of Selective Demolition Activities: Indicate the following:

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

Interruption of utility services. Indicate how long utility services will be interrupted.

Coordination for shutoff, capping, and continuation of utility services.

Means of protection for items to remain and items in path of waste removal from building.

1.07 PROJECT CONDITIONS:

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

B. Provide not less than 72 hours notice to Owner of activities that will affect Owner operations.

C. Review first paragraph and subparagraph below and revise if necessary. In subparagraph, include list of items that will be removed by Owner.

D. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

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

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

G. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

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

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

PART 2 - PRODUCTS

2.01 DESCRIPTION:

A. Provide all materials, equipment and labor necessary to perform the demolition as required.

B. For materials required for this work, comply with the applicable specification sections in Division 23.

PART 3 - EXECUTION

3.01 PREPARATION:

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

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

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

D. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

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

F. Cover and protect furniture, furnishings, and equipment that have not been removed.

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

H. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

I. Strengthen or add new supports when required during progress of selective demolition.

3.02 GENERAL:

A. Provide alteration and demolition of mechanical facilities as required by the drawings and specifications.

B. Do not begin work until time schedules and manner of operations have been approved by the Owner's Representative.

C. All interruptions of existing services shall be included in the Owner approved schedules, and so identified.

D. Verify the location of all related existing equipment, piping and other mechanical facilities. Provide for the removal, relocation, rerouting and reconnecting of this work as required because of demolition methods or sequences employed. Obtain the Owner's permission prior to commencing any work.

E. Comply with the installation procedures specified in the applicable specification sections in Division 23.

F. Where existing equipment must remain in service during construction, provide rerouting and reconnecting of mechanical services as required to maintain continuous service.

G. Maintain system continuity and operation of piping or ductwork circuits, whether spliced, extended, relocated or newly constructed.

H. Store, on the site, materials and equipment to be salvaged for future use by the Owner.

I. All ductwork and piping hangers, supports, anchors, etc., shall be removed along with all ductwork and piping shown to be removed.

J. Where equipment, ductwork and piping is removed or disconnected under DIVISION 23, perform the work in such a manner that no damage is done to the structure or remaining portions of the existing systems. Do not under any circumstances place a stress on existing ductwork or pipe and fittings which are to be reused. Be fully responsible for and repair, at no additional expense to Owner, any leaks developing in existing piping or ductwork due to failure to take proper precautions when making alterations.

3.03 PIPING:

A. All welded piping shall be cut off square at the locations indicated on the demolition drawings. All openings of any remaining valves, piping or fittings shall be closed off with weld caps or blind flanges to prevent debris from entering the existing systems.

B. All threaded piping shall be disconnected at the location indicated on the demolition drawings. All openings of remaining valves, piping, fittings and equipment shall be closed off with pipe plugs or pipe caps as required to prevent debris from entering the existing systems.

C. All pipe hangers, supports, and/or anchors shall be removed along with all piping shown to be removed.

D. Provide shutoff valves to isolate new work from existing and temporary or permanent connections to new work as required for proper testing and cleaning of new work.

3.04 DUST CONTROL:

A. Provide dust barriers as necessary to control the migration of dust during demolition of spaces.

B. Provide temporary ventilation of all spaces during demolition work.

3.05 INSULATION:

A. Insulation shall be removed from all piping, fittings, valves and equipment designated for demolition.

B. Comply with all safety precautions related to insulation removal.

3.06 CLEANING:

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

END OF SECTION 23 00 40

SECTION 23 00 50
MECHANICAL: ELECTRICAL COMPONENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and Section 23 00 00 Mechanical General Requirements, and the following listed sections as a minimum, apply fully to work in this section.

B. Refer to all construction documents including all of the Sections of Division 23 for a complete understanding of the electrical components required. Coordinate with all trades.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

C. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 01 50	MECHANICAL: VIBRATION ISOLATION
Section 23 03 00	MECHANICAL: FIRE SAFING / FIRESTOPPING
Section 23 10 00	PLUMBING
Section 23 85 00	HVAC: EQUIPMENT
Section 23 95 00	HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Motor Contactors
Motors
Electrical connection diagrams
Electric Motor Starters

1.06 PROJECT CLOSEOUT:

A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Record Drawings
Operating, Maintenance Instructions
Written Guarantee
Lubrication, Filters
Operating, Maintenance Manuals
Cleaning
Test Log
Letters of compliance.

PART 2 - ELECTRICAL PRODUCTS / DATA

2.01 GENERAL:

A. Provide new, standard products, materials and equipment which comply with the specification; are undamaged and unused at the time of installation; are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use.

2.02 COMPONENT INSTALLATION:

A. Provide the electrical components to the electrical equipment installer for mounting and installation.

B. Combination Electric Motor Starters and Variable Frequency Drives shall not be mounted directly on any mechanical piece of equipment unless specifically indicated on the mechanical drawings.

2.03 ELECTRICAL CURRENT CHARACTERISTICS:

A. Refer to the Electrical Drawings and field coordinate the electrical components of the mechanical systems specified in this Division.

Building Electrical Service:	120 / 208V, 3 phase, 4 wire	
Motors:	1/2 HP and larger:	208V, 3 phase
Smaller than 1/2 HP	120V, 1 phase	

2.04 ELECTRICAL CONNECTIONS AND WIRING:

A. The Electrical Contractor shall provide power wiring complete from power source to motor or equipment junction, including power wiring through starters and line voltage control apparatus. The Mechanical Contractor(s) shall furnish and the Electrical Contractor shall install all electric motor starters.

B. The mechanical/temperature controls contractor(s) shall provide all wiring, relays, transformers, devices, etc. necessary (regardless of voltage) for automatic controls.

C. Wiring provided by Mechanical Contractor(s) shall be in accordance with the National Electric Code, local and state codes and Division 016. Wiring shall be in conduit, regardless of voltage, unless noted otherwise.

2.05 ELECTRICAL DEVICE COORDINATION:

A. Do NOT operate electrical devices until:

Voltage available on all phases is in accordance with nameplate.
Direction of rotation is checked.
Full load voltage reading is not less than nameplate.
Full load amperage reading is not greater than nameplate.

2.06 ELECTRIC MOTOR STARTERS:

A. Manufacturer: Cutler-Hammer
Square D
Allen Bradley
General Electric

B. Types Required:

Start/Stop Automatic control at Equipment:

Start/Stop Automatic control at Remote Location:

C. Provide proper heater in all motor starters furnished.

D. Check proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of thermal overloads for each starter and leave inside starter enclosure.

E. Provide a minimum of two (2) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter. Motor starters shall have NEMA I enclosures. Those in wet locations shall be NEMA 3R.

END OF SECTION 23 00 50

SECTION 23 01 50
MECHANICAL: VIBRATION ISOLATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed sections:

Section 23 00 50	MECHANICAL: ELECTRICAL COMPONENTS
Section 23 02 50	MECHANICAL: PIPE HANGERS AND SUPPORTS
Section 23 10 00	PLUMBING
Section 23 17 00	PLUMBING: NATURAL GAS PIPING
Section 23 80 00	HVAC: AIR HANDLING SYSTEMS
Section 23 85 00	HVAC: EQUIPMENT
Section 23 95 00	HVAC: TESTING ADJUSTING BALANCING

1.02 GENERAL REQUIREMENTS:

A. Provide vibration isolation supports for all air systems, equipment and piping as outlined below.

B. Devices shall be selected, installed, and adjusted in a manner to prevent objectionable vibration transmission to the structure.

C. Seismic restraints are not included in this section of the specification. See Division 23, Section 23 02 00 MECHANICAL SEISMIC RESTRAINT for seismic restraint requirements. All restraints to be separate and not interfere with vibration isolation devices or must be fully consolidated to perform both tasks.

1.03 APPROVED MANUFACTURERS:

A. Provide all vibration isolation devices, including auxiliary steel bases and pouring forms, as designed by a single manufacturer.

B. Approved manufacturers: Mason Industries
Kenetics
Amber-Booth
Vibration Mountings and Controls

C. Engage manufacturer to provide technical supervision of installation of vibration control products.

1.04 SUBMITTALS:

A. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

B. Vibration Isolators: Provide catalog cuts, show drawings and other documents as necessary to indicate equipment unit number, isolator type, scheduled deflection, proposed deflection under operating load, spring free height, spring operating height, spring solid height (at coil bind), and spring coil diameter for each isolator. Indicate the weight and lowest rotational speed of equipment supported by each isolator.

Submittal Format:	Example:
Supported Equipment	AHU-1
Isolator Type	Mason SLF
Equipment Weight	4900 lbs.
Lowest Speed	800 RPM
Schedule Deflection	2.5 inches
Operating Deflection	2.6 inches
Spring Free height	9.6 inches
Operating Height	7.0 inches
Solid Height	5.6 inches
Spring Height	6.2 inches
Remarks:	

C. Equipment Bases: Provide detailed drawings for steel bases and fan sub-bases showing all steel work, reinforcing, method of isolator attachment, and location of equipment attachment bolts.

D. Concrete Inertia Bases: Provide shop drawings showing all steel work, required concrete, method of isolator attachment, and location of equipment attachment bolts.

E. Reports: Provide inspection reports from the isolator manufacturer or representative indicating that the installations are complete and correct in every respect.

F. Shop Drawings: submit shop drawings and manufacturer's installation instructions for thrust restraints wherever they are required.

G. Submission of samples may be requested for each type of vibration isolator device. After approval, samples will be returned for installation at the job. All costs associated with submission of samples shall be borne by the Contractor.

1.05 DRAWINGS:

A. Detailed drawings are schematic only. The size and number of mounts and hangers shall be chosen to meet these specifications.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS:

A. Steel springs and neoprene elements shall have static deflections under operating load equal or greater than deflections shown on the schedules. Isolators submitted on the basis of rated loads will be disapproved.

B. All steel springs as installed shall have minimum additional travel to solid (coil bind) equal to 50% of the deflection under operating load.

C. Spring diameter shall be no less than 0.8 of the compressed height of the spring at operating load.

D. All neoprene components shall be selected for maximum hardness of 40 durometer, show A rating where possible. In no case shall hardness exceed 50 durometer. Bridge bearing quality neoprene meeting AASHO Highway Bridge Specifications shall be used in all elastomeric components where installed in irretrievable locations and as noted elsewhere in the documents.

E. All isolators supporting a given piece of equipment shall be selected for approximately equal spring deflection.

F. Steel springs shall not take a permanent set when compressed to coil bind.

G. Steel springs shall be color-coded to allow positive identification after installation.

2.02 CORROSION PROTECTION:

A. All vibration isolators and associated hardware shall be designed or treated for resistance to corrosion. All isolators shall be stainless steel.

2.03 VIBRATION ISOLATOR TYPES:

A. Type **F**. Elastomeric hanger shall be a neoprene-in-shear element mounted in a hanger box. The neoprene element shall be molded with a rod isolation bushing that prevents the rod from contacting the hanger box. Design for 0.25 – 0.35 inch minimum static deflection at rated load. Isolators shall be Mason model HD, WHD, Amber-Booth model BRD, Kinetics model RH or approved equal.

PART 3 – EXECUTION

3.01 MANUFACTURER'S RESPONSIBILITY:

A. The vibration isolation manufacturer or his authorized representative shall alert the Engineer to any isolator selections which may experience resonance with the approved equipment and upgrade any isolators that are found to resonate with the supported equipment. He shall provide supervision as may be necessary to assure correct installation and adjustment. He shall submit a written report to the Architect at completion of the Work, certifying correctness of the installation and compliance with Contract Documents.

3.02 GENERAL:

A. All equipment and piping shall be resiliently mounted on or suspended from approved foundations and supports, with isolation pads, mounts and hangers as specified herein and as shown on drawings. Contractor shall cooperate with the Architect to replace any isolators that need to be upgraded from what is shown on the drawings if equipment operating results in resonance with building natural frequencies.

3.03 MOUNTS AND HANGERS:

A. Location of all vibration isolation equipment shall be selected for ease of inspection and adjustment as well as proper operation.

B. Installation of vibration isolation equipment shall be in accordance with the manufacturer's instruction.

C. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment.

D. Isolators for equipment with bases shall be located on the sides of the bases that are parallel to the equipment shaft unless this is not possible because of physical constraints.

E. Hanger rods for vibration isolated support shall be connected to structural beams or joists, not from the floor slab between beams and joists. Provide intermediate support members as necessary.

F. Vibration isolation hanger elements shall be positioned as high as possible in the hanger rod assembly, but not in contact with the building structure so that the hanger housing may rotate a full 360 degrees about the rod axis without contacting object.

G. Adjust all leveling bolts and hanger rod so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.

H. Limit stops shall be out of contact during normal operation.

I. Parallel pipes may be hung together on a trapeze that is isolated from the structure. Isolator deflections must equal the greatest deflection for the grouped pipes if isolated individually. Do not mix isolated and non-isolated pipes on the same trapeze.

3.04 CORROSION RESISTANCE:

A. Treat isolation systems for corrosion resistance. Coatings damaged during installation shall be repaired.

3.05 INDEPENDENT SUPPORTS:

A. Isolated systems shall be independent. Piping, ductwork, conduit or mechanical equipment shall not be hung from or supported on other equipment, pipes or ductwork installed on vibration isolators. Maintain 2" clearance between isolated equipment and walls, ceilings and other equipment. Drain piping connected to vibration isolated equipment shall not contact the building structure or other non-isolated systems.

3.06 SUPPORT DUCTWORK AS FOLLOWS:

A. In slabs and walls, provide a ½" to 1" clearance for all penetrating ducts when not precluded by fire dampers. Pack the clear space full-depth with fiberglass insulation, and caulk penetration airtight on both sides of wall or slab.

3.07 SUPPORT PIPES AS FOLLOWS:

A. For all pipes over 1" in diameter, provide metal sleeves sized for ¼" to ½: clearances at wall and slab penetrations, and seal tightly in place. Pack with fiberglass insulation, and caulk airtight at each end of the sleeve.

3.08 CURB-MOUNTED ROOFTOP FANS:

A. Fans shall be supplied with factory installed neoprene vibration isolators separating the motor, drive assembly and impellor from the base. There shall be no rigid short circuit of these isolators through bolting, rigid conduit or other components of the curb-mounting assembly. Type A elastomeric pads, correctly sized, shall be installed to entirely separate the fan base from the curb.

END OF SECTION 23 01 50

SECTION 23 02 50
MECHANICAL: PIPE HANGERS AND SUPPORTS

PART I GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed sections:

Section 23 01 50 MECHANICAL: VIBRATION ISOLATION

Section 23 04 00 MECHANICAL: INSULATION

Section 23 10 00 PLUMBING
Section 23 17 00 PLUMBING: NATURAL GAS PIPING

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

1.02 SCOPE:

A. Section Includes: Pipe hangers and supports, pipe saddles and shields, and pipe guides and anchors for piping systems except for fire protection piping systems.

1.03 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.04 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The listing below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Product data sheets: Provide product data sheets for all hangers and supports intended for use on the project.

Pipe Hangers
Hanger Rod

Structural Attachments
Insulation Shields
Sleepers

Shop Drawings: Submit shop drawings detailing application, type of support, loading, size and method of attachment of pipes for:

Pipe racks

1.05 QUALITY ASSURANCE:

A. Pipe hangers, pipe supports, hanger and support accessories, pipe saddles and pipe shields, where applicable, shall comply with provisions of latest edition of ASME Code for Pressure Piping ANSI/ASME B31.I - Power Piping, Fed. Spec. No. WW-H171, Manufacturers' Standardization Society Standard Practice SP-58 and SP-69, and these Specifications. Where there is conflict, these Specifications shall govern.

B. Hangers, supports, accessories, saddles and shields shall be load-rated. Load ratings shall be established by manufacturers based upon testing and analysis in conformance with above referenced codes. Manufacturers load tests shall be made on both supporting materials and configurations. Tests shall be performed by independent testing laboratory. Results of these tests shall be made available to the Owner upon request.

C. Manufacturers shall select hangers, supports, accessories, saddles and shields based on load ratings for applications involved.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS:

A. Manufacturer(s) Specified:

Grinnell Corp.
Carpenter & Paterson, Inc.
Michigan Hanger Co., Inc.
Penn Pipe Hangers Div. of Penn Construction Industries
Power Piping Co.
Basic Engineers, Inc.
National Pipe Hanger Corp.
B-Line Systems, Inc.

B. General Requirements:

Pipe hangers, supports and accessories specified herein are from master specifications and include hangers, supports and accessories for various piping materials and applications. Refer to related Sections for actual piping materials required for the Project and select hangers, supports and accessories for applications involved.

Auxiliary structural steel, not part of building structure, required for support of piping shall be as required and necessary. Provide unistrut of strength required. Pipe used as supports is not acceptable. All metal surfaces shall be painted. Metal exposed to weather shall be galvanized.

Unless otherwise shown or specified, hangers, supports and accessories for insulated piping systems shall be sized to accommodate pipe insulation system, and shall fit around outside of

pipe insulation without crushing and penetrating pipe insulation. Refer to specifications for piping insulation for detailed specifications of insulation and inserts at hangers and supports.

Hangers, supports and accessories exposed to weather or corrosive environments shall be protected with factory-applied corrosion-resistant finish. Provide galvanized or cadmium-plated finish except when it is specified that components and assemblies are to be constructed of stainless steel, or copper-plated steel.

Certain piping shall be resiliently supported. Refer to requirements for vibration isolation.

C. Corrosion Resistance:

All hanger and support components are to be constructed of stainless steel.

D. Pipe Attachments:

Hangers for bare steel pipe 2” and smaller shall be light- duty steel clevis hangers. For 2-1/2” and larger use standard- duty steel clevis hangers. All stainless-steel construction.

Hangers for bare cast iron and PVC soil pipe shall be standard- duty steel clevis hangers. All stainless-steel construction.

Hangers for insulated pipe and tubing of 4.1/2” OD combined and smaller shall be light-duty steel clevis hangers. Above 4-1/2” OD combined, use standard-duty steel clevis hangers. All stainless-steel construction.

E. Risers:

Riser clamps for bare steel pipe 20” and smaller shall be clamp on type, stainless-steel riser clamps.

Riser clamps for bare cast iron or PVC pipe shall be clamp on type, stainless-steel riser clamps. Locate under coupling or bell of pipe.

Riser clamps for cold (70 degrees F and below) insulated copper tubing shall be stainless-steel, insulated pipe riser clamps. Insulation shall prevent condensation in ambient conditions.

Roller Supports: See Paragraph, Roller Supports and Hangers elsewhere herein.

Adjustable Pipe Stanchion: Steel, Grinnell Figure 191 (maximum 12” pipe size) consisting of support with vertical adjustment and U-bolt. Include double nuts for vertical adjustment and for each side of U-bolt attachment. Select and size to allow pipe movement.

Offset Pipe Clamps: Steel, Grinnell Figure 103 (maximum 12” pipe size). Select and size to allow pipe movement.

2.02 PIPE SHIELDS AND INSERTS:

A. Manufacturers:

Pipe Saddles and Shields with Inserts:

Grinnell Corp.
Carpenter & Paterson, Inc.
Michigan Hanger Co., Inc.

Penn Pipe Hangers Div. of Penn Construction Industries
Power Piping Co.
Basic Engineers, Inc.
National Pipe Hanger Corp.
B-Line Systems, Inc.

Preinsulated Pipe Shields

Pipe Shields, Inc.
Basic Engineers, Inc.
Power Piping Co.
B-Line Systems, Inc.

B. General Requirements:

Provide the following at pipe hangers and supports:

Either inserts with pipe shields or preinsulated pipe shields for other insulated piping systems as defined herein.

Pipe saddles and inserts with pipe shields shall be of sufficient length for applications involved.

Pipe saddles and inserts with pipe shields shall be selected and sized to accommodate supported loads. Spacing of pipe hangers and supports may have to be adjusted accordingly; refer to Article, Pipe Hangers and Supports herein.

Pipe saddles and inserts shall be same thickness as adjacent piping insulation system.

C. Insulation Shields:

Provide galvanized steel insulation shields at locations of pipe hangers for piping systems with ID less than 2”. Insulation shields shall extend 6” on either side of hanger and shall be with rounded edges.

D. Inserts:

Select inserts for insulated piping systems for placement directly at pipe hanger and support locations. Inserts shall be placed in direct contact with piping. Inserts shall have acceptable proportion of sodium plus silicate ions to chloride ions to prevent corrosion.

PART 3 EXECUTION

3.01 PIPE HANGERS AND SUPPORTS:

A. General:

Supports shall secure pipes in place, prevent swaying and vibration, maintain required grading by proper adjustments and provide for expansion, contraction, anchorage and piping insulation protection. Design supports of strength and rigidity to suit loading and service. Include weight of water and fluids wed for cleaning and testing. Supports shall not unduly stress building construction.

B. Installation of pipe hangers and supports shall conform to:

Manufacturers Standardization Society (MSS) Standard Practice:

SP-69 Pipe Hangers and Supports - Selection and Application

In case of conflict, more stringent requirements shall apply.

C. Hanger and Support Spacing:

Pipe hangers and supports shall be selected and spaced on basis of building structure, loading limitations, imposed loads, and pipe stress. Tables below are based on pipe stress only.

Maximum pipe hanger and support spacing dimensions specified or listed herein are for bare pipe without additional loads such as flanges, valves, piping specialties, accessories, insulation or other forces. Certain spacing dimensions are recommended by piping manufacturers or are accepted good practice. Reduce spacing from maximums shown or specified as required to accommodate actual imposed loads of piping systems in conjunction with load limitations of building structure and elements of pipe hanger and support systems including pipe saddles, pipe shields and inserts.

Maximum spacing of hangers and supports for standard weightsteel pipe shall conform to requirements of ANSI/ASME B31.I - Power Piping and Manufacturer's Standardization Society Standard Practice (MSS) SP-69. Pipe Hangers and Supports for reference as follows:

Pipe Size Inches	Maximum Spacing Feet Water Service	Maximum Spacing Feet Vapor Service
½ and smaller	7	8
¾, 1, 1-1/4	7	9
1-1/2	9	12
2	10	13
2-1/2	11	14
3	12	15
4	14	17

Maximum horizontal spacing of hangers and supports for copper tubing shall conform to requirements of manufacturers Standardization Society (MSS) Stand Practice SP-69 listed for reference as follows:

Nominal Tube Size Inches	Maximum Spacing Feet Water Service	Maximum Spacing Feet Vapor Service
½ & 3/8	5	6
¾	5	7
1	6	8
1-1/4	7	9
1-1/2	8	10
2	8	11
2-1/2	9	13

For cast iron and PVC type piping systems (including ductile iron and high silicon), provide minimum of one (1) hanger per pipe section and locate close to joint on pipe bar Provide hangers at changes in direction and at branch connections. Maximum hanger spacing shall not exceed 10 feet.

Provide supports for riser (vertical) piping at each floor except where shown or specified otherwise.

D. Intermediate Attachments:

Attachments shall be selected on basis of building structure and loads to be supported. Maximum applied loads shall not exceed manufacturer's published load data. Install per manufacturer's instructions.

E. Pipe Attachments:

Do not hang one pipe from another nor from ductwork and conduits. Do not use perforated band iron, wire nor chain as hangers.

Unless otherwise specified or shown on the Drawings, piping shall be suspended by individual hangers.

Drainage piping shall be suspended by individual hangers only.

Where piping must be suspended closer to overhead than is possible with single rod clevis hangers, trapeze supports shall be used as specified further herein.

At pipe bends, place hanger no more than ½" from bend.

Apply double wraps of 3M Co. No. 51 Scotchwrap PVC tape with pressure-sensitive adhesive around bare piping where piping materials are dissimilar from pipe attachments. Scotchwrap is not required where pipe attachments are specified to have protective coating or match piping material being supported.

Select and install pipe attachments to permit expansion and contraction.

3.02 PIPE PIPE SHIELDS AND INSERTS:

A. Install and position pipe saddles and weld to pipe in accordance with manufacturer's recommendations. Insulate fully with inserts of same insulation used for adjacent pipe insulation.

B. Install pipe shields on flexible foamed insulation such that shield is centered under insulation inserts. Coat inserts with compatible wet adhesive and insert into snuggly cut undersized holes in pipe insulation. Stabilize large and heavy pipes with additional inserts (hardwood dowels) at 4 and 8 o'clock positions. After installation, coat outer surface and vapor-seal with adhesive, then apply layer of pressure-sensitive adhesive vapor barrier tape.

3.03 Install and orient highest density insulation section of preinsulated pipe shields to bottom of pipe and assemble as directed by manufacturer of preinsulated pipe shields.

A. Piping system applications involving double rollers, clamps, U-bolts and similar devices shall have pipe saddles and inserts with pipe shields at both top and bottom of piping.

B. Coordinate the Work with insulation subcontractor.

END OF SECTION 23 02 50

SECTION 23 03 00
MECHANICAL FIRE SAFING / FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed sections:

Section 23 10 00 PLUMBING
Section 23 17 00 PLUMBING: NATURAL GAS PIPING

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the Firesafing / Firestopping work as herein specified.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor: Cutting, Patching, and Painting
Flashing
Openings in walls

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

C. Shop Drawings: For each different firestopping configuration, provide the following:

Listing agency's detailed drawing showing opening, penetrating items, and firestopping materials, all of which are identified with listing agency's name and number or designation, fire rating achieved, and date of listing.

Identify which rated assembly each system is to be used in.

Any installation instructions that are not included on the detailed drawing.

For proposed systems that do not conform strictly to the listing, submit listing agency's drawing marked to show modifications and stamped approved by firestop system manufacturer's fire protection engineer.

D. Submit listing agency's test report showing compliance with requirements, based on testing of current products.

E. Product Certificates: Submit certificates signed by firestop system manufacturer certifying that materials furnished comply with requirements.

F. Product Data: Manufacturer's data sheets on each material to be used in firestop system systems, including:

Product characteristics and Material Safety Data Sheets.
Listing numbers of systems in which each product is to be used.
Preparation instructions and recommendations.
Storage and handling requirements and recommendations.
Installation methods.

Installer's Qualification Documentation.

1.06 REFERENCES:

ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.

ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000a.

ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2000.

ASTM E 1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems; 1997 (Reapproved 2000).

ASTM E 1529 - Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies; 2000.

ASTM E 1725 - Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components; 1995 (Reapproved 2001).

UL 1479 - Standard for Fire Tests of Through-Penetration Firestops; 1994.

UL 1709 - Rapid Rise Fire Tests of Protection Materials for Structural Steel; 1994.

ANSI/UL 2079 - Tests for Fire Resistance of Building Joint Systems; 1998.

1.07 DEFINITIONS:

A. Construction Gap: An open joint between adjacent rated assemblies; may be a moving joint or static opening, without penetrating items.

B. Firestop System: Specific firestop material or materials, which when installed in openings in a specific rated assembly, achieve the performance required.

C. Firestopping: Result of installation of firestop system.

D. Listing: The current, published listing of a system in a qualified listing agency's directory.

E. Listing Agency: Independent testing agency that has conducted tests and classified firestop systems for particular applications, which conducts routine in-plant follow-up inspections, and which lists tested systems in a published directory.

F. Penetrating Item: Any item (pipe, duct, conduit, cable, etc.) that passes completely through a rated assembly through an opening of any size.

G. Rated Assembly: A wall, floor, roof/ceiling, or other construction that is required to have an hourly fire rating or a smoke resistance rating.

H. Through Penetration: A hole through a rated assembly made to accommodate the passage of a penetrating item or an empty hole made for another purpose and not repairable using the original materials of construction.

1.08 QUALITY ASSURANCE:

A. Installer Qualifications: Firm who is qualified by having experience, staff, and training to install the specified products, and who:

Is a Certified and Trained contractor in the field of fire stopping and fire safing.
Is acceptable to or licensed by manufacturer.
Is acceptable to or licensed by authority having jurisdiction.
Has completed the manufacturer's certified product installation training.
Can provide a list of completed projects as evidence of experience; include project name and address, Owner's name and address, and Architect's name and phone number.

B. Pre-Installation Meeting: Conduct a meeting at the project site to discuss installation conditions and requirements; require the attendance of all relevant installers.

1.09 DELIVERY, STORAGE, AND HANDLING:

A. Deliver and store products until ready for installation in manufacturer's original unopened packaging, legibly marked with manufacturer's name and product identification, date of manufacture, lot number, shelf life, listing agency's classification marking, curing time, and mixing instructions if applicable.

B. Following manufacturer’s instructions, store and handle in such a manner as to prevent deterioration or damage due to moisture, temperature changes, contaminants, and or other causes.

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

1.10 PROJECT CONDITIONS:

A. Coordinate construction and cutting of openings so that each particular firestop system may be installed in accordance with its listing, including sizing, sleeves, and penetrating items.

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

C. Provide ventilation as required by firestopping manufacturer, including mechanical ventilation if required.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Acceptable Manufacturer:

3M Fire Protection Products, Inc
Hilti Fire Stop Products.

B. Single Source: All instances of a specific firestop system shall be made using products of the same manufacturer; where multiple installers (e.g. different subcontractors) are responsible for installation of firestopping, all installers shall use the same system made by the same manufacturer.

C. Where a proposed system is not listed by one of the listing agencies specified as acceptable, submit evidence prepared by a qualified independent testing agency that the system complies with the requirements.

2.02 MATERIALS:

A. Rated Assemblies: Provide installed firestopping that limits the spread of fire, heat, smoke, and gasses through otherwise unprotected openings in rated assemblies, including walls, partitions, floors, roof/ceilings, etc.45

B. Provide firestopping that has fire resistance rating equal to or greater than the fire-resistance rating of the assembly in which it is to be installed.

C. Provide firestopping that has movement capability appropriate to the potential movement of the gap.

D. Requirements for All Types of Firestopping:

Listing Agency: Provide systems that are listed by at least one the following:

Underwriters Laboratories Inc. (UL), in "Fire Resistance Directory" category XHEZ or XHBN as appropriate.

ITS, in “Directory of Listed Products.”

Omega Point Laboratories (OPL), in “Directory of Listed Products, Through Penetration Fire Resistance Directory.”

Any other qualified independent testing and inspection agency that conducts periodic follow-up inspections and is acceptable to authorities having jurisdiction.

Furnish products identical to those tested for classification by listing agency.

Mark product packing with classification marking of listing agency.

Unlisted Systems: Where firestop systems not listed by any listing agency are required due to project conditions, submit a substitution proposal with evidence specified.

Firestopping Exposed To View: Provide products with flame spread index of less than 25 and smoke developed index of less than 450, when tested in accordance with ASTM E 84.

Firestopping Exposed to View, Traffic, Moisture, or Physical Damage: Provide products that after curing do not deteriorate when exposed to those conditions during and after construction.

Materials: Use only products specifically listed for use in listed systems.

Compatibility: Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.

E. Through Penetration Firestop Systems (All Types Except Electrical Penetrations): Provide firestop systems listed for the specific combination of fire rated construction, type of penetrating item, annular space requirements, and fire rating, and:

F-Rating: Provide firestopping that has F-rating equal to or greater than the fire-resistance rating of the assembly in which the firestopping will be installed.

T-Rating: In habitable rooms and areas, where penetrating items are exposed to potential contact with materials on fire side(s) of rated assembly, provide firestopping that has a T-rating equal to its F-rating.

Wall Penetrations: Provide systems that are symmetrical, with the same rating from both sides of the wall.

Cold Smoke Resistance: Provide firestopping that has L-rating of 1 cfm per linear foot (5.5 cu m/h/m), maximum.

Testing: Determine ratings in accordance with ASTM E 814 or UL 1479.

Provide asbestos-free products.

Schedule of Systems: Indicated on the drawings

F. Through Penetration Firestop System For Electrical Penetrations: Provide firestopping complying with UL system No.5, R11044, tested in accordance with UL 1709, ASTM E 119, ASTM E 1529, and ASTM E 1725.

Smoke and Flame Sealant: 3M FireDam(tm) 150+ Caulk, 3M Fire Barrier CP 25WB+ Caulk, or 3M Fire Barrier IC 15WB Caulk.

Tape for Vapor Barrier, Heat Reflector, and Installation Aid: 3M Interam(tm) T-49 aluminum foil tape.

Tape for Installation: Scotch 898 Filament Tape.

Sheet to Cover Openings and as Collar: 3M Fire Barrier CS-195+ Composite Sheet.

Cast In Place Devices: 3M Fire Barrier Cast In Place Devices.

PART 3 EXECUTION:

3.01 EXAMINATION:

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

B. Conduct tests according to manufacturer's written recommendations to verify that substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt and other foreign substances capable of impairing bond of firestopping.

C. Verify that items penetrating fire rated assemblies are securely attached, including sleeves, supports, hangers, and clips.

D. Verify that openings and adjacent areas are not obstructed by construction that would interfere with installation of firestopping, including ducts, piping, equipment, and other suspended construction.

E. Verify that environmental conditions are safe and suitable for installation of firestopping.

F. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION:

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.

B. Install masking and temporary coverings as required to prevent contamination or defacement of adjacent surfaces due to firestopping installation.

3.03 INSTALLATION:

A. Install in strict accordance with manufacturer's detailed installation instructions and procedures.

B. Install so that openings are completely filled and material is securely adhered.

C. Where firestopping surface will be exposed to view, finish to a smooth, uniform surface flush with adjacent surfaces.

D. After installation is complete, remove combustible forming materials and accessories that are not part of the listed system.

E. Repair or replace defective installations to comply with requirements.

F. At each through penetration, attach identification labels on both sides in location where label will be visible to anyone seeking to remove penetrating items or firestopping.

G. Clean firestop materials off surfaces adjacent to openings as work progresses, using methods and cleaning materials approved in writing by firestop system manufacturer and which will not damage the surfaces being cleaned.

H. Notify authority having jurisdiction when firestopping installation is ready for inspection; obtain advance approval of anticipated inspection dates and phasing, if any, required to allow subsequent construction to proceed.

I. Do not cover firestopping with other construction until approval of authority having jurisdiction has been received.

3.04 PROTECTION:

A. Protect installed systems and products until completion of project; where subject to traffic, provide adequate protection board.

B. Touch-up, repair or replace damaged systems and products before Substantial Completion.

END OF SECTION 23 03 00

SECTION 23 04 00
MECHANICAL INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed sections:

Section 23 02 50 MECHANICAL: PIPE HANGERS AND SUPPORTS

Section 23 10 00 PLUMBING

Section 23 80 00 HVAC: AIR HANDLING SYSTEMS

1.02 SCOPE

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

B. Work includes but is not limited to:

Hot Piping systems insulation
Cold Piping systems insulation

Duct insulation

Condensation (anti sweat) insulation

1.03 RELATED WORK

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Flashing
Openings in walls
Equipment foundations and supports
All temporary heating

1.04 PROJECT ADMINISTRATION

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Piping Insulation, All Systems
Duct Insulation, All Systems
Vapor Barrier Materials

C. General Materials:

A complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories for each mechanical system requiring insulation shall be included. Materials furnished under this section of the specification shall be submitted at one time.

Provide a schedule for each system including the following:

Material
Thickness
“k” value
Density
Finish
Jacket

D. Samples:

Thermal Insulation Materials: After approval of materials, actual sections of installed systems, properly insulated in accordance with the specification requirements, shall be displayed. Such actual sections must remain accessible to inspection throughout the job and will be reviewed from time to time for controlling the quality of the work throughout the construction site. Each material used shall be identified, by indicating on an attached sheet the specification requirement for the material and the material by each manufacturer intended to meet the requirement. The Owner will inspect display sample sections at the jobsite. Approved display sample sections shall remain on display at the jobsite during the construction period. Upon completion of construction, the display sample sections will be closed and sealed.

1.06 SYSTEM DESCRIPTION

A. Field-applied insulation and accessories on mechanical systems shall be as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated.

B. Insulation Systems are as follows:

Anti Sweat	AS
Heat Conservation:	HC
Cold Conservation:	CC
Energy Conservation	EC
Personal Protection:	PP

Piping Systems – Insulation systems are as follows:

Domestic cold water	AS/CC
Domestic hot water	HC

Ductwork – Insulation systems are as follows:

Kitchen Hood Exhaust Ductwork	HC/PP

1.07 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. At the discretion of the Owner, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

American Society for Testing And Materials (ASTM)

ASTM C 1136 (1995) Flexible, Low Permeance Vapor Retarders for Thermal Insulation

ASTM C 553 (2000) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

ASTM C 647 (1995; R 2000) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation

ASTM C 916 (1985; R 1996el) Adhesives for Duct Thermal Insulation

ASTM E 84 (2001) Surface Burning Characteristics of Building Materials

ASTM E 96 (2000e1) Water Vapor Transmission of Materials

1.08 GENERAL QUALITY CONTROL

A. Standard Products:

Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

B. Installer's Qualifications:

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

C. Surface-Burning Characteristics:

Unless otherwise specified, insulation not covered with a jacket shall have a flame spread index no higher than 75 and a smoke developed index no higher than 150. Insulation systems which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50. Insulation materials located exterior to the building perimeter are not required to be fire-rated. Flame spread, and smoke developed indexes, shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Material supplied by a manufacturer with a jacket shall be tested as a composite material. Jackets, facings, and adhesives shall have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in accordance with ASTM E 84.

D. Identification of Materials:

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material.

1.09 STORAGE

A. Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Owner may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means.

PART 2 PRODUCTS GENERAL

2.01 GENERAL MATERIALS

A. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either the wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C 195.

Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50 when tested in accordance with ASTM E 84. Adhesive shall be pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding fibrous glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations.

Contact Adhesive

Adhesives may be dispersed in a volatile organic solvent. Adhesives may be any of, but not limited to, the neoprane based, rubber based, or elastomeric type that have a flame spread index no higher than 25 and a smoke developed index no higher than 50 when tested in the dry state in accordance with ASTM E 84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation shall be used to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E 84. Tape shall be 4 inch wide rolls.

Staples

Outward clinching type ASTM A 167, Type 304 or 316 stainless steel. Monel is a nickel rich alloy that has high strength, high ductility, and excellent resistance to corrosion.

Jackets

ASTM C 921, Type I, maximum moisture vapor transmission 0.02 perms, (measured before factory application or installation), minimum puncture resistance 50 Beach units on all surfaces where a minimum puncture resistance of 25 Beach units is acceptable. Minimum tensile strength, 35 pounds/inch width. ASTM C 921, Type II, minimum puncture resistance 25 Beach units, tensile strength minimum 20 pounds/inch width. Jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing. Based on the application, insulation materials that require factory applied jackets are mineral fiber, cellular glass, and phenolic foam. All non-metallic jackets shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84.

White Vapor Retarder All Service Jacket (ASJ)

For use on hot/cold pipes, ducts, or equipment vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting without sizing.

Polyvinyl Chloride (PVC) Jackets

Polyvinyl chloride (PVC) jacket and fitting covers shall have high impact strength, UV resistant

rating or treatment and moderate chemical resistance with minimum thickness 0.030 inch.

Vapor Retarder Mastic Coatings

The vapor retarder coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall be determined according to procedure B of ASTM E 96 utilizing apparatus described in ASTM E 96. The coating shall be a nonflammable, fire resistant type. All other application and service properties shall be in accordance with ASTM C 647.

Laminated Film Vapor Retarder

ASTM C 1136, Type I, maximum moisture vapor transmission 0.02 perms, minimum puncture resistance 50 Beach units on all surfaces except concealed ductwork, where Type II, maximum moisture vapor transmission 0.02 perms, a minimum puncture resistance of 25 Beach units is acceptable.

Polyvinylidene Chloride (PVDC) Film Vapor Retarder

The PVDC film vapor retarder shall have a maximum moisture vapor transmission of 0.02 perms, minimum puncture resistance of 150 Beach units, a minimum tensile strength in any direction of 30 lb/inch when tested per ASTM D 882, and a maximum flame spread/smoke developed index of 25/50 per ASTM E 84.

Polyvinylidene Chloride Vapor Retarder Adhesive Tape

Requirements must meet the same as specified for PVDC Film Vapor Retarder in paragraph above.

Non-Vapor Retarder Mastic Coatings

ASTM C 1136, Type III, maximum moisture vapor transmission 0.10 perms, minimum puncture resistance 50 Beach units on all surfaces except ductwork, where Type IV, maximum moisture vapor transmission 0.10, a minimum puncture resistance of 25 Beach units is acceptable.

Wire

Soft annealed ASTM A 580/A 580M Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

Sealants

Sealants shall be chosen from the butyl polymer type, the styrene-butadiene rubber type, or the butyl type of sealants. Sealants shall have a maximum moisture vapor transmission of 0.02 perms, and a maximum flame spread/smoke developed index of 25/50 per ASTM E 84.

PART 3 INSULATION SYSTEMS: PIPING

3.01 INSULATION: GENERAL

A. Install insulation in a neat and workmanlike manner, observing the best practices of the trade. Longitudinal seams shall be flat and face structure away from view. Insulation shall be smooth throughout. No raw ends of insulation will be permitted; cover raw ends with caps.

3.02 INSULATION SYSTEM: DOMESTIC WATER PIPING

A. Scope / Insulation System:

Domestic Cold Water	CC / AS
Domestic Hot Water	HC

B. Materials: Provide one piece insulation of long, fine flame attenuated glass fibers, covered with factory applied all purpose jacket of white kraft bonded to aluminum foil and reinforced with fiberglass yarn.

Flame spread:	25
Smoke developed:	50
Conductivity:	.24 at 100 degree F (mean)

C. Fittings and valves shall be covered with similar material, of same thickness, as pipe covering with vapor seal and PVC premolded plastic jacket.

D. Workmanship: Apply pipe insulation over clean, dry surfaces, with adjoining sections firmly together. Insulate flanges, valves and fittings with mitered segments of pipe insulation of equal thickness. Fittings on 2" and smaller pipe may be insulated with insulating cement of equal thickness. Insulation and vapor barrier shall pass uninterrupted through all hangers, supports and pipe sleeves.

INSULATION THICKNESS SCHEDULE

Pipe Size:	1/2" thru 1-1/2"	2" thru 3”	4” and larger
Pipe Use:			
Hot Water, Recirc.	1"	1"	2”
Cold Water	1/2"	1"	1 ½”

E. Scope: All domestic water system piping. Pre-molded PVC coverings on exposed piping within finished spaces and within the crawl space.

3.03 PVC FITTING COVERS

A. Provide PVC premolded, one piece, high impact covers with fiberglass inserts and accessories for elbows tees, valves, caps, couplings, specialties, etc.

Surface burning characteristics	25 Flame 50 Smoke
UL Listed 94V-0	
Insert thermal conductivity	.26K @ 75°F

B. Installation: Fiberglass insert shall be wrapped completely around the fitting or snugly positioned inside the PVC Cover for proper fit. The Cover shall be applied over the fitting and insert, and the throat secured by tack fastening, taping, sealing with a solvent type PVC adhesive, or banding.

C. Cold Pipe: Fitting systems below ambient temperature shall be with a continuous vapor barrier, with PVC Tape, PVC Adhesive, or a vapor barrier mastic as specified by the engineer. When using PVC Tape, use a 2" minimum downward overlap. Care should be taken not to stretch the last 2" of PVC Tape, to avoid stretching or creeping.

D. Scope: Provide premolded PVC coverings on exposed piping only.

3.04 PVC INSULATION JACKET

A. All piping exposed to view within occupied spaces and within the crawl space beneath the building shall be fit with insulation faced with a white, PVC exterior jacket. Piping insulation within mechanical spaces does not require PVC jacketing.

B. The jacketing shall be installed such that it extends into all wall sleeves, out of view, past escutcheons. All seams shall be continuously cemented and arranged such that they are out of view. Jacketing for pipe insulation shall be Zeston 2000 PVC jacketing, 20 mils thick, white to match fitting covers. Jacket shall be ASTM E84 rated 25/50. Manufacturer shall provide Zeston Perma-Weld solvent welding adhesive to seal PVC lap joints.

PART 4 INSULATION SYSTEMS DUCTWORK

4.01 FIRE RATED DUCT WRAP SYSTEM:

A. Service / Insulation System:

	Kitchen Hood Exhaust Ductwork	HC / PP
	Unenclosed Duct Risers*	HC / PP

*Ductwork risers penetrating more than one occupied floors that are not otherwise enclosed within rated shaft construction.

B. General: The fire resistive duct wrap system shall be a lightweight non-asbestos, high-temperature, inorganic, ceramic fiber blanket totally encapsulated in foil/scrim having a service temperature range up to 2300°F. DuctWrap is directly applied to commercial grease hood duct systems and air duct systems to allow zero inch clearance to combustible construction and to provide a two-hour fire-resistive duct enclosure. DuctWrap, in conjunction with CAJ7013, CAJ7015, CAJ7020 or CAJ7022 through-penetration firestop system is an alternative to rigid shaft enclosures. Duct Wrap is applied in a continuous wrap from the point the duct enters a concealed space to its exit from a building.

C. Scope: All kitchen hood exhaust ductwork installed within the building envelope. All ductwork risers penetrating more than one occupied floor that are not otherwise enclosed within rated shaft construction.

D. Performance requirements:

Two-hour rated fire-resistive enclosure assembly, ASTM E119: Large Scale Wall Panel Test and Total Engulfment Test.

Zero inch clearance to combustible, maximum allowable surface temperature on unexposed side, UL 1978.

Class I interior finish materials, ASTM E84.

Through-penetration protection systems for grease and air ducts, ASTM E814 and UL 1479.

Non-combustibility, ASTM E136.

ISO-6944-1985, Fire Resistance Tests - Ventilation Ducts.

PART 5 EXECUTION

5.01 GENERAL:

A. Installation:

Insulation shall only be applied to non-operating, unheated and uncooled piping and equipment. Flexible elastomeric cellular insulation shall not be compressed at joists, studs, columns, ducts, hangers, etc. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour, shall be replaced.

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the job site. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA Insulation Stds plates except where modified herein or on the drawings.

B. Fire-Stopping:

Where pipes and ducts pass through firewalls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials.

C. Painting and Finishing:

Painting shall be as directed by the Owner or to match existing requirements.

D. Installation of Flexible Elastomeric Cellular Insulation

Flexible elastomeric cellular insulation shall be installed with seams and joints sealed with rubberized contact adhesive. Insulation with pre-applied adhesive is not permitted. Flexible elastomeric cellular insulation shall not be used on surfaces greater than 200 degrees F. Seams shall be staggered when applying multiple layers of insulation. Insulation exposed to weather and not shown to have jacketing shall be protected with two coats of UV resistant finish as recommended by the manufacturer after the adhesive is dry. A brush coating of adhesive shall be applied to both butt ends to be joined and to both slit surfaces to be sealed. The adhesive shall be allowed to set until dry to touch but tacky under slight pressure before joining the surfaces. Insulation seals at seams and joints shall not be capable of being pulled apart one hour after application. Insulation that can be pulled apart one hour after installation shall be replaced.

E. Pipes / Ducts / Equipment which require Insulation:

Insulation is required on all pipes, ducts, or equipment, unless specifically noted otherwise.

5.02 PIPE INSULATION INSTALLATION

A. General:

Pipe insulation shall be installed on aboveground hot and cold pipeline systems as specified below to form a continuous thermal retarder, including straight runs, fittings and appurtenances unless specified otherwise. Installation shall be with full-length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used.

Pipe insulation shall be omitted on the following:

Pipe used solely for fire protection.

Chromium plated pipe to plumbing fixtures. However, fixtures for use by the physically handicapped shall have the hot water supply and drain, including the trap, insulated where exposed.

Sanitary drain lines.

Air chambers.

B. Pipes Passing Through Walls, Roofs, and Floors

Pipe insulation shall be continuous through the sleeve.

An aluminum jacket with factory applied moisture retarder shall be provided over the insulation wherever penetrations require sealing.

Where pipes penetrate interior walls, the aluminum jacket shall extend 2 inches beyond either side of the wall and shall be secured on each end with a band.

Where penetrating floors, the aluminum jacket shall extend from a point below the backup material to a point 10 inches above the floor with one band at the floor and one not more than 1 inch from the end of the aluminum jacket.

Where penetrating waterproofed floors, the aluminum jacket shall extend from below the backup material to a point 2 inches above the flashing with a band 1 inch from the end of the aluminum jacket.

Where penetrating exterior walls, the aluminum jacket required for pipe exposed to weather shall continue through the sleeve to a point 2 inches beyond the interior surface of the wall.

Where penetrating roofs, pipe shall be insulated as required for interior service to a point flush with the top of the flashing and sealed with vapor retarder coating. The insulation for exterior application shall butt tightly to the top of flashing and interior insulation. The exterior aluminum jacket shall extend 2 inches down beyond the end of the insulation to form a counter flashing. The flashing and counter flashing shall be sealed underneath with caulking.

C. Pipes Passing Through Hangers:

Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 2 inches and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 2 inches shall be installed.

Horizontal pipes larger than 2 inches at 60 degrees F and above shall be supported on hangers in accordance with MSS SP-69.

Horizontal pipes larger than 2 inches and below 60 degrees F shall be supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-69. An insulation insert of cellular glass, calcium silicate (or perlite above 80 F) or the necessary strength polyisocyanurate, shall be installed above each shield. The insert shall cover not less than the bottom 180-degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 2 inches on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 1 inch, wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe from crushing the insulation, as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

5.03 DUCT INSULATION INSTALLATION

A. Installation through Sleeves and at Fire Dampers:

Duct insulation shall be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder shall cover the collar, neck, and any non-insulated surfaces of diffusers, registers and grills. Vapor retarder materials shall be applied to form a complete unbroken vapor seal over the insulation.

B. Installation on Concealed Ductwork:

For rectangular, oval or round ducts, insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6-inch wide strips on 12 inch centers.

For rectangular and oval ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.

For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 16-inch centers and not more than 16 inches from duct corners.

Insulation shall be impaled on the mechanical fasteners (self stick pins) where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor retarder jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hangers.

Self-locking washers shall be installed where mechanical fasteners are used. The pin shall be trimmed back and bent over.

Jacket overlaps shall be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams shall be coated with a brush coat of vapor retarder coating or PVDC adhesive tape.

Breaks in the jacket material shall be covered with patches of the same material as the vapor retarder jacket. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with tape and staples. Staples and tape joints shall be sealed with a brush coat of vapor retarder coating or PVDC adhesive tape.

At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor retarder coating or PVDC adhesive tape.

Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating. The coating shall overlap the adjoining insulation and non-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.

C. Installation on Exposed Ductwork:

For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches.

Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed or bent over.

Joints in the insulation jacket shall be sealed with a 4-inch wide strip of tape. Tape seams shall be sealed with a brush coat of vapor retarder coating.

Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.

At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor retarder coating.

Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and non-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as per MICA standards.

END OF SECTION 23 04 00

SECTION 23 04 40
MECHANICAL: PIPE CLEANING AND TESTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 10 00 PLUMBING
Section 23 17 00 PLUMBING: NATURAL GAS PIPING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

B. This specification defines the requirements and procedures for field pressure testing of above ground and underground piping systems, connected equipment and integral components to assure mechanical strength and tightness. Also included are flushing and cleaning requirements for open and/or closed piping systems. Any deviation from this specification shall require written approval from the Engineer.

C. Testing Exclusions: The following are excluded from the testing requirements of this specification:

Any package unit previously tested by the manufacturer in accordance with the applicable codes.

Any piping specialties, accessories, and equipment including rupture discs, relief valves, traps, orifice plates, instruments and filters.

Piping systems, which are tested in accordance with the applicable building and fire codes and the requirements of those codes are in excess of that required herein.

Lines and systems open to the atmosphere such as safety valve discharges, vents or drains downstream of the last shutoff valve. These lines shall be visually inspected to determine that all joints are properly made up.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs
Openings in walls

All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following submittals shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Sources of All Cleaning and Testing Agents
Pressures and Temperatures for Final Testing
Date of Test for Each System
Name and Address of Testing and Cleaning Contractor / Contractors
Test pressures and holding time
Calibration record of pressure measuring devices and relief devices settings
Cleaning and Testing Materials to be used with Recommended Temperatures
Chemical Treatment Materials to be used with Recommended Temperatures

Means of disposal of flushing, testing and cleaning solutions. *(The Contractor shall contain and legally dispose of all cleaning and testing solutions.)*

Summary report of testing and cleaning results, including testing log for all systems, chemical treatment solutions in place and chemical analysis of system water after testing and cleaning procedures are complete.

1.06 QUALIFICATIONS:

A. Qualified Contractors shall be recognized as firms specializing in providing services related to the requirements of this specification. All Contractors providing Pipe Cleaning and Testing Services shall have a minimum of three years of documented experience.

1.07 PROJECT CLOSEOUT:

A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements.

PART 2 PRODUCTS

2.01 CLEANING PRODUCTS:

A. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

2.02 PIPE CLASS TABLE:

PIPE CLASS	PIPE MATERIALS	NOTES:
	Copper and brass	
U2	Copper Tubing Type L	Soldered Joints
U3	Copper Tubing Type K	Soldered Joints
	Steel	
F11	Carbon Steel	Propane / Natural Gas
	Iron	
D2	Cast Iron Service Wgt	No Hub
	Plastic	
P1	PVC drainage	Solvent joints

2.03 CLEANING CLASS:

A. Cleaning Class C1:

Covers water flushing and cleaning of piping systems after assembly and erection. Cleaning shall be accomplished by thoroughly flushing with clear water at sufficient velocity to remove all foreign matter.

B. Cleaning Class C2:

Covers the blowing-out of piping systems after assembly and erection. Blow out agent shall be steam (S), oil free air (A), or nitrogen (N)

C. Cleaning Class C3:

Covers water flushing and disinfecting of above and below ground potable water piping systems after assembly and erection. Cleaning of piping shall be accomplished by first thoroughly flushing with potable water at sufficient velocity (2.5 fps mm.) to remove all foreign matter and then sterilizing with chlorine solution (100 ppm of available chlorine for a minimum contact time of 2 hours).

2.04 TESTING CLASS:

A. Testing Class T1:

Covers initial service leak testing per ASME B31 .3, Category D, at operating pressure and leak test inspection of piping systems after assembly and erection.

B. Testing Class T2:

Covers hydrostatic leak and pressure testing and inspection of piping systems after assembly and erection.

C. Testing Class T3:

Covers pneumatic leak and pressure testing and inspection of piping systems after assembly and erection. Pneumatic agent shall be oil free air, or nitrogen (N).

D. Testing Class T4:

Covers static head leak test and test inspection of piping systems after assembly and erection. Piping systems are to be tested and inspected for leak tightness while being subjected to the internal test pressure of a 10 foot static head. Water shall stand in the system without change in level for a period of not less than 5 hours.

2.05 REFERENCES

A. Piping tests shall comply with the provisions of the latest edition of ASME B31 .3 Process Piping, section 345, Testing. Any conflict between Code and Specification shall be referred to the Engineer for resolution.

B. Piping cleaning/disinfecting of piping systems shall comply with the provisions of the current edition of the Uniform Plumbing Code, ANSI A40.8 Section 10.9 or AWWA C601. Any conflict between Code (5) and Specification shall be referred to the Engineer for resolution.

C. The maximum test pressure for each line shall be as per ASME B31 .3 Process Piping, section 345, Testing.

2.06 PIPING SYSTEMS: CLEANING AND TESTING:

PIPE SYSTEM	SYMBOL	PIPE CLASS	CLEANING CLASS	TESTING CLASS	TEST PRESSURE
PLUMBING:					
Cold Water - Domestic Potable	CW	U2	C3	T2	125 psig
Hot Water - Domestic Potable	HW	U2	C3	T2	125 psig
Sanitary Waste Underground - CI	SAN	D1	C1	T4	10ft wc
Sanitary Vent Underground - CI	V	D1	C1	T4	10ft wc
Sanitary Waste - CI	SAN	D2	C1	T4	10ft wc
Sanitary Vent - CI	V	D2	C1	T4	10ft wc
Sanitary Waste - PVC	SAN	P1	C1	T4	10ft wc
Sanitary Vent - PVC	V	P1	C1	T4	10ft wc
Water Service	W	U4	C3	T2	1.5 x max
Propane Fuel Gas	PG	U4	C2(A)	T3	10 psig

2.07 PRESSURE TESTING:

A. Cleaning Products

Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

PART 3 EXECUTION

3.01 PRESSURE TESTING: GENERAL REQUIREMENTS FOR TESTING

A. Leak testing shall be done in accordance with ANSI B31.3 Process Piping, section 345, Testing. Upon completion of system(s) erection work and cleaning, but prior to adjusting and balancing, all installed piping and/or tubing shall be pressure tested except where otherwise qualified in this specification.

B. Piping that is to be chemically cleaned after installation shall be tested and all repairs made before cleaning.

C. Contractor shall provide competent personnel to conduct all tests. System(s) shall not be considered complete until all tests have been concluded to the satisfaction of the Engineer. In the event of leakage or defects, tests must be repeated until all faults are corrected.

D. Contractor shall furnish all instruments, ladders, test equipment, test tees, accessories, and personnel required for the tests.

E. All successful tests shall be documented and certified by the General Contractor with the resulting data transmitted to the Architect, to be retained as a permanent record.

F. Tests shall be considered satisfactory if no leakage is detected on the piping and any of the joints. After this initial period, pressure shall be maintained until system is inspected for leaks and thereafter, for specified time periods according to system tested.

Areas requiring repairs shall be retested as originally specified.

G. Following the completion and approval of the test, Contractor shall restore all components of the system to normal operating condition. This includes removing the temporary provisions installed for the test.

H. Piping shall be tested at metal temperatures between 60°F and 100°F.

I. Hydrotest equipment shall include at least one NIST standard calibrated pressure measuring device (to be installed at the highest point in the tested system) and a calibrated pressure relieving device.

J. The following systems may be tested pneumatically:

Gas lines.

K. The following shall be excluded from all pressure tests:

Pumps and water heaters.

Equipment and vendor furnished piping specifically recommended by the manufacturer not to be tested.

3.02 APPLICATION: TEST METHODS AND PRESSURES

A. Hydrostatic Testing of Piping Designed for Internal Pressure

The hydrostatic test pressure shall not be less than 1.5 times the design pressure.

If the design conditions of piping attached to a vessel are the same as those of the vessel, then the piping and vessel may be tested together at the test pressure of the vessel. However, if the piping should be subject to higher design conditions and requires a higher test than the connected equipment, or if the piping is designed for lesser operating conditions than the connected equipment and could be overstressed by a system test, then it shall be isolated and tested separately.

B. Pneumatic Testing

If the piping is tested pneumatically, the minimum test pressure shall be 110 percent of the design pressure.

C. Static Head Test

This test covers leak testing of all non-pressure plumbing and drainage systems, including sanitary sewer, storm drainage, etc. All piping in this test shall be subjected to an internal test pressure not less than 10-foot static head of water.

3.03 PRESSURE TESTING: PREPARATION FOR FIELD PRESSURE TEST

A. All valves (except vents, drains, and hydro boundary valves) within the system to be tested shall be in open position; control valves shall be specifically checked to assure that they are in an open position or they shall be bypassed or removed during testing.

B. Shut-off valves at instruments on process lines or equipment shall be closed.

C. Equipment that is not to be hydrostatically tested shall be isolated or removed from the system. If valves are used for isolation, Contractor shall verify that valves can withstand the test pressure in the closed position without any damaging effect.

D. System relief and safety valves shall be blanked off at the inlet flange of the valves. Screwed relief and safety valves shall be removed and replaced with plugs, or capped.

E. All flanges, threaded joints and welds shall be left bare of insulation and unpainted. All underground pipe joints shall be bare and exposed for a distance of two feet on each side of joints and shall not be backfilled or encased in concrete until final testing approval.

F. All joints, including welds, shall be left uninsulated and exposed for examination during the test; however, joints previously tested in accordance with this specification may be insulated or covered. If a sensitive test is required, all joints mentioned above shall be left unprimed and unpainted.

G. Underground portions of piping systems may be tested and covered before testing aboveground portions.

H. Before testing:

Piping systems shall have been completely checked (Punched Out).

All lines, vessels, and equipment shall be checked to ensure that the entire system can be completely drained after testing.

Vents or other high point connections shall be opened to eliminate air from lines that receive a hydrostatic test.

System shall be purged of air before hydrostatic test pressure is applied.

System shall be thoroughly vented to remove all air pockets before the hydrostatic test pressure is applied.

Field personnel shall review all vessels and internals in order to determine best method to prevent air entrapment when filling and to prevent vacuum when draining.

Short pieces of piping that must be removed to permit installation of a blind or blank shall be tested separately.

Lines containing check valves shall have the source of pressure located in the piping upstream of the check valve so that the pressure is applied under the seat. If this is not possible, remove or jack up the check valve closure mechanism or remove check valve completely, and provide necessary filler piece or blinds.

When conducting tests at freezing temperatures, the test shall not take more than 4 hours, and special precautions (such as warming the line test water, or both) shall be observed to avoid freezing damage.

When a pressure test is required to be maintained for a period of time during which the testing medium in the system would be subject to thermal expansion, provision shall be made for relief of any pressure greater than the maximum test pressure.

3.04 FIELD PRESSURE TEST PROCEDURES

A. General:

Pressure Testing and Cleaning Procedure Index:

Pressure testing procedures shall be selected based on service and line class according to the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

The testing of piping and/or tubing, and equipment shall be performed on a system basis, in preference to the testing of individual lines or single components if at all possible. Breaking joints to insert blinds for hydrostatic testing shall be avoided wherever possible.

Special equipment shall be tested only as per instructions by the Engineer and/or Owner.

B. Hydrostatic Pressure Test:

In order to hydrostatic test as much piping as possible at one time, a systems test may be employed. This test shall include 1 or more lines and if possible connected vessels and equipment.

The minimum test pressure for a system test shall be such that each line in the system is subjected to a test pressure in accordance with the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

The maximum system test pressure shall not exceed the pressure test rating of any piping component or the shop test pressure of any vessels or equipment included in the test system. (Maximum test pressure for flanges and valves conforming to ASME B16.5 are given in the table as included herein under the heading PIPING SYSTEMS: CLEANING AND TESTING.

Systems or sections of systems to be tested may be isolated by closed valves, provided the valve body and seat are suitable for the test pressure. Do not use closed diaphragm valves for isolation.

Where a suitable valve is not available, vessels, equipment, or other piping not included in the system pressure test shall be either disconnected from the a system or isolated by blinds or other means during the test.

The normal locations for the pressure test gauge are at grade near the pressure test pump. Readings may be made at higher points providing the gauge pressure reading and the static head (0.433 psi/ft) between grade and the point of measurement do not exceed the maximum

test pressure. Pressure test gauges shall be calibrated once a month, using a dead weight tester. Gauges shall be tagged with the date last calibrated, and this activity shall be recorded.

Hydrostatic test pressure shall not be applied until the vessel or equipment and its contents are at approximately the same temperature. To minimize the risk of brittle fracture, pressure tests through vessels and equipment shall not be conducted when the test liquid or metal temperature is below 60°F.

Hydrostatic test pressure shall be maintained for a sufficient length of time to visually determine whether there are any leaks, but not less than 1 hour. Contractor shall not be required to maintain test pressure in excess of 2 hours after notification of the client's authorized inspector.

C. Pneumatic Test Procedure:

Minimum Metal Temperature

At time of testing the minimum pipe metal temperature shall be as follows:

All ferric piping: 60°F
All copper: 40°F

Minimum temperatures for materials not listed above, shall be determined by the Engineer of Record and the Owner when required by field construction.

Clear the test area of all nonessential personnel before bringing the line up to test pressure. It may be desirable to conduct pneumatic tests during weekends when fewer personnel are deemed necessary to protect workers during such tests.

A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 50 psi or 10 percent of the test pressure.

When pneumatic testing at over 25 psig, a preliminary check at 25 psig shall be made to locate major leaks. The pressure shall be increased in gradual steps of 5 psig, or 10 percent of the test pressure, whichever is greater.

A double block and bleed valve arrangement shall be included in the pressurizing line to the system being tested. A test pressure gauge shall be downstream of the double block. After each pressure step has been reached, close the block valve and open the bleeder to atmosphere. If after a 5-minute period the step pressure is held, proceed to the next step pressure. If not, examine the entire system for leakage.

Before soaping the joints, the entire line should be walked to determine whether there is any audible evidence of leakage. Any leaks found at the time shall be marked, and repaired after first de-pressuring the line.

When the system has been brought up to the test pressure shown on the line list, all joints and welds shall be covered with soap solution in order to detect any leakage.

Bolting shall not be tightened while systems being tested are pressured above 30 psig.

Pneumatic test pressure shall be maintained for a sufficient length of time to permit thorough visual inspection of all joints and weld seams but not less than 2 hour. Pressure shall be reduced gradually when de-pressuring.

D. Static Head Test Procedure

Underground pipe joints shall be exposed for a distance of two feet on each side of joints and shall not be backfilled until piping has been tested and approved.

Piping which connects to or is continuous with lines installed by others shall be isolated from these lines by a valve or line blind.

All openings will be provided with temporary plugs except the highest (fill opening)

Piping system shall be filled with clean water to the top vent stack. Systems without a vent stack shall be provided a temporary vertical stack. Stack shall be at least 10 feet in length.

Water shall stand in the system without change in level for a time period of not less than 5 hours.

Joints having leaks shall be repaired and retested for a time period of I hour.

E. Test Completion

In the event that repairs or additions are made following the pressure test, the affected piping shall be retested at the pressures originally specified for the test

After completion of testing, all temporary blanks and blinds shall be removed, all operating blinds returned to proper position, and all lines and piping components shall be completely drained. Valves, orifice plates, expansion joints, and short pieces of piping that have been removed shall be reinstalled with as specified proper new gaskets in place. All valves that were closed during hydrotest shall be opened to ensure drainage of the bonnet cavity. Lines being drained after testing shall have all vents open. Piping systems downstream of check valves should be inspected to ensure complete drainage.

Care shall be exercised in controlling the rate of drainage from vessels with respect to the inflow of air through the vent to ensure that the vessel is not subjected to vacuum. After vessels have been completely drained, vents, cyclones, and other internal closures that were opened before testing shall be closed.

3.05 CLEANING; GENERAL PREPARATION

A. General Contractor shall schedule testing so that sanitizing and passivation of tubing system(s) immediately follows testing of system.

B. Schedule field cleaning as close to the commissioning of the equipment as possible.

C. Protect threaded connections, flange faces, and valves to prevent damage by abrasion.

D. Block off, disconnect or remove the following items from the piping system to be cleaned:

Filters

Exposed instruments, gauges

Relief valves, and plug cocks

Materials that may become damaged by cleaning solutions or procedures

E. Do not allow aluminum, copper, galvanized steel, magnesium, or zinc surfaces to come in contact with solutions having a pH of less than 4.0 or a pH more than 10.

F. Do not introduce chemical solution into equipment unless high point vents and low point drains (supplied by piping contractor) are available to ensure proper filing and complete removal of solutions.

END OF SECTION 23 04 40

SECTION 23 10 00
PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50	MECHANICAL: ELECTRICAL COMPONENTS
Section 23 01 50	MECHANICAL: VIBRATION ISOLATION
Section 23 02 50	MECHANICAL: PIPE HANGERS AND SUPPORTS
Section 23 03 00	MECHANICAL: FIRE SAFING / FIRESTOPPING
Section 23 04 00	MECHANICAL: INSULATION
Section 23 04 40	MECHANICAL: PIPE CLEANING TESTING
Section 23 15 00	PLUMBING: FIXTURES
Section 23 17 00	PLUMBING: NATURAL GAS PIPING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

B. Work specified within this Section is limited to 5'-0" beyond building limit.

C. Work required beyond 5 ft from building limit is specified within Division 31.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list is not intended to be all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Pipe and fittings
Hangers / Supports
Valves
Insulation
Clean outs
Floor drains
Backflow preventers
Fixtures and Fixture carriers (See Section 23 15 00)
Hot Water Heaters
Potable Water Expansion Tanks
Vacuum breakers
Sillcocks
Grease interceptors

1.06 INSPECTION AND TESTING: BY AUTHORITIES / AGENCIES

A. Inspections, examinations and tests required by authorities/agencies shall be coordinated and paid for as necessary by the Plumbing Contractor to obtain complete and final acceptance of the systems. Transmit certificates of inspection, acceptance to the Architect.

1.07 QUALITY ASSURANCE:

A. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1.08 FLUSHING, CLEANING AND TESTING: BY CONTRACTOR

A. Provide all labor, equipment and expertise to flush, clean and test all piping systems installed. Isolate all sections and equipment as necessary to complete the flushing, cleaning and testing according to the requirements of SECTION 23 04 40 MECHANICAL: PIPE CLEANING - TESTING.

1.09 UTILITY CONNECTIONS / COORDINATION / METERS

A. Review all contract documents with the proper utility companies prior to the start of any work to insure that meters, testing, inspections, acceptances will all be properly completed in a timely manner.

B. Report any alterations required to insure utility company coordination.

1.10 SEISMIC SUPPORTS, HANGERS AND RESTRAINTS

A. Provide all seismic supports, hangers and restraints as required within Section 23 02 00 MECHANICAL SEISMIC RESTRAINT

1.11 ENERGY CONSERVATION:

A. All work shall be in compliance with the energy conservation requirements of the IECC.

B. Work indicated in excess of the minimum shall be provided as shown.

C. Provide proper insulation, heat traps, controls and equipment such that systems are energy conserving and efficient.

1.12 PROJECT CLOSEOUT:

A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Operating, Maintenance Instructions
Lubrication
Cleaning
Sterilization
Record Drawings
Written Guarantee
Operating, Maintenance Manuals
Test Log
Letters of compliance

PART 2 - PIPING: PRODUCTS AND INSTALLATION

2.01 PIPING: INSTALLATION, GENERAL:

A. Provide new, standard products, materials and equipment which comply with the specification; are undamaged and unused at the time of installation; are complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use.

B. Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible. Form right angles or parallel lines with building wall. Keep pipe close to walls, partitions and ceilings. Offset only where necessary to follow walls. Where so indicated and wherever possible, conceal piping in building construction before erection of closing construction. When furred spaces are indicated, keep pipes as close to structural members as possible. Piping shall not

interfere with openings, doors and windows. Allow for proper clearance at windows, doors, equipment and other building parts such that pipes do not interfere with access and building use.

C. Piping shall be cut accurately to measurements established at the site and shall be installed without springing, forcing and excessive cutting or weakening of building structure. Pipes shall be installed in a manner permitting proper drainage, venting and free expansion and contraction. Changes in direction shall be made with factory-manufactured fittings.

D. Install pipe to allow for expansion without excessive stress on pipe, hangers and building.

E. Welding, brazing, soldering shall be with proper regard for fire prevention and safety. See Fire Watch requirements.

F. Arrange piping passing through floors, walls and other partitions of building construction so that piping is centered in openings/sleeves and is rigidly supported on both sides of openings/sleeves.

G. Clean pipe, pipe fittings, and valves before erection. Cap or plug open ends of piping and equipment during construction to keep dirt and foreign material out of system.

H. As specified elsewhere, certain service piping and associated fittings. Valves and accessories will be furnished factory-cleaned and sealed.

I. Unions or flanges shall be used to facilitate piping installation, and shall be installed between shut-off valves and equipment to facilitate removal of equipment for repair.

J. Provide dielectric unions where pipes of dissimilar metals are joined together.

K. Isolate and drain existing systems as required to complete the Work. Fill, circulate and vent both new and existing systems as required for proper operation.

L. Copper tube, of annealed or bending temper quality, where indicated to be installed without joints or fittings, shall be bent to accomplish changes of direction. Bending shall not collapse outside nor buckle inside of bend. Proper radius, method and tools required shall comply with Copper Tube Handbook.

M. Do not route pipelines over switchboards, panels, motor control centers, individual motor starters and other electrical equipment.

N. Avoid routing pipelines over electrical raceways and bus ducts. If these locations cannot be avoided, provide drip pans under pipelines. Also provide drip pans where indicated on the Drawings. Drip pans shall be constructed of minimum 22 gauge stainless sheet metal with waterproof mastic applied to interior seams and joints. Pan width shall be minimum 2 times pipe diameter and with sides turned up minimum of 4” high and fitted with hemmed edge. Do not hang drip pans from pipe. Pitch pans minimum 1/8” per foot and provide 3/4” drain connection at low points. Pipe drains to nearest floor drain or as shown on the Drawings.

2.02 CROSS AND INTER-CONNECTIONS:

A. No piping for fixtures, equipment, devices or internal connections shall be installed which will provide a cross or interconnection, under any circumstance of operation, between a distributing supply for drinking or domestic purposes and a not-potable supply. A non potable supply would include a drainage system or a soil or sanitary waste pipe which would permit or make possible the backflow of sewage, polluted water or waste into the domestic water supply system.

2.03 PIPE: SANITARY SEWER PVC (Below Grade)

PIPE CLASS:	P2
PIPE SYMBOL	SAN
CLEANING CLASS	C1
TESTING CLASS	T4

A. Materials: Provide PVC Gravity Sewer Pipe with ring-tite joints complying with ASTM D 3034-SDR35.

B. Appurtenances: Provide elbows, tees, wyes, couplings, caps of the same type and class of material as the pipe, or of a material having equal or superior physical and chemical properties.

C. Installation:

Install pipe in accordance with governing authorities having jurisdiction.

Inspect pipe prior to installation to detect any apparent defects. Mark defective material with white paint and remove from site.

Lay pipe beginning at the low point of the system, true to the grades, inverts and alignment indicated with unbroken continuity of invert.

Install compression gaskets in accordance with manufacturer's instructions as to lubricants, cements, and other special requirements.

D. Installer: A firm specializing and experienced in sanitary sewer system work for not less than two (2) years.

E. Connections: Provide connection to manholes as indicated and in accordance with the sewer authority. Provide labor and materials to rework table as required.

F. Changes in direction/elevation: Roll down or offset at no greater than 45 deg.

G. Cleanouts: Provide cleanouts to grade at all changes of direction / elevation, at intervals as required by Code and as indicated on the drawings.

H. Building Sewer Cleanout: Provide at the point sanitary piping exits the building a cleanout to floor level with specified cover/cap.

I. Bedding: Provide sand/gravel bedding material. No stone, ledge to be within 6" of invert of pipe. Provide pipe cradles in fill or unsuitable material.

J. Cover: Provide minimum of 3'-0" cover. Notify Architect if this requirement does not appear to be attainable.

K. Test: Cap or plug piping at any manhole and fill system to grade, let stand for a period of 2 hours, no appreciable fall in level will be allowed.

2.04 PIPING: SANITARY WASTE and VENT - PVC (ABOVE SLAB)

PIPE CLASS:	P1
PIPE SYMBOL	SAN – For VENT see legend
CLEANING CLASS	C1
TESTING CLASS	T4

A. Material: Provide type PVC Schedule 40 sanitary drainage piping with drainage type fittings, free of defects, as manufactured by Celanese, Yardley or ITT Grinnell.

B. Joints: Solvent fused socket type with chemical designed for use with the type PVC piping system.

C. Cleanouts: Provide cleanouts at changes of direction and at intervals as required by Code and as indicated.

D. Workmanship: Pitch piping at a rate of 1/4 " per foot unless noted otherwise and install parallel or perpendicular to building.

E. Supports: See PIPE SUPPORTS.

F. Vents through roof: Provide no-hub cast iron vents through roof. Provide rigid support to structure at and below roof to insure stable vertical vent.

G. Fixture Waste Connections: Exposed piping to plumbing fixtures shall be chrome plated brass with chrome plated brass traps as specified. Fixtures shall be trapped separately with trap screws below water line.

H. Inspection/Testing: Provide labor and equipment to test the piping system as follows:

Fill system to roof for a period of 2 hours.

I. Inspect all joints to insure watertight connections, coordinate approval of local authority prior to closing in.

2.05 PIPING: SANITARY WASTE (ABOVE SLAB) *No Hub*

PIPE CLASS:	D2
PIPE SYMBOL	See Legend
CLEANING CLASS	C1
TESTING CLASS	T4

A. Material: Provide no-hub, cast iron pipe, free of sandholes, cracks, or other defect. Pipe shall be of uniform weight, size and wall thickness, in accordance with CISPI-301 latest standard.

Manufacturer: Charlotte, Tyler or AB & I..

Standards: ASTM-A-888 Standard Specifications for Hubless Cast Iron Soil Pipe and Fittings
ASTM-C-564 Standard Specifications for Rubber Gaskets for CI Pipe
CISPI 301 Standard Specifications Hubless Cast Iron Soil Pipe and Fittings

B. Joints: Provide heavy duty no-hub couplings mfg. by Clamp all-125, Husky SD 4000 or MG.

C. Cleanouts: Provide brass cap cleanouts at all changes in direction with extensions as necessary for accessibility.

D. Workmanship: Piping shall evenly pitch at 1/4" per foot unless noted. Install piping parallel or perpendicular to the building and allow for pipe expansion.

E. Fixture Waste Connections: For exposed connections provide chrome-plated brass. Provide separate trap for each fixture with clean out below water line.

F. Tests: Test all piping prior to fixture connection. When weather conditions warrant an air test may be made, with Architect's approval, in lieu of water test. For water test: Plug all openings and connections; fill system with water to level of top vent; let stand and inspect all joints for a period of one hour. If lines prove tight, draw off water and connect fixtures.

2.06 PIPING: DOMESTIC WATER, ABOVE GRADE:

PIPE CLASS:	U2
PIPE SYMBOL	CW / HW / HWR See Legend
CLEANING CLASS	C3
TESTING CLASS	T2

A. Material: Pipe shall be Type-L copper tubing with wrought copper fittings as manufactured by Revere, Anaconda, or Chase.

B. Joints: Install with sweat joints with lead free solder; remove all excess flux and solder from piping.

C. Water Hammer Arrestors: At all branches and risers, provide water hammer arrestor as specified under Part 5 -Equipment/Appurtenances.

D. Workmanship: Ream pipe to full inside diameter to remove all burrs before joining. Install piping parallel or perpendicular to building or as indicated. Install in a manner to allow for expansion.

E. Test: Perform a hydrostatic pressure test at 150 psi for a period of 30 minutes until system is proved tight. Test pressure drop shall not exceed 1 psi during test period. For piping that is to be concealed, perform all tests while accessible.

2.07 COPPER PRESS TYPE FITTINGS: (Contractor’s Option)

A. Manufacturers, Copper Press Fittings:

Viega, 17545 Daleview Dr., Lakewood, OH 44107, 877.620.0016 or Ridge Tool Co., 400 Clark Street, Elyria, OH 44035, 800.519.3456

B. Material:

Press Fittings: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-rings for copper press fittings shall be EPDM.

C. Installation, Fittings for Copper Tubing:

Press connections: Copper press fittings shall be made in accordance with the manufacturers installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

2.08 PIPE STERILIZATION, DOMESTIC WATER PIPING SYSTEMS:

A. Pipe Sterilization: Sterilize the system with chlorine prior to acceptance for domestic use in accordance with requirements of AWWA C651, AWWA C652, or as described as follows:

The piping system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.

Once clean water has been found to be flowing at all points of outlet, the system, or part thereof, shall be filled with a water/ chlorine solution containing at least 50 parts per million (50mg/L) of chlorine, and the system, or part thereof, shall be valved off and allowed to stand for 24 hours. As an alternate, the system, or part thereof, shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.

Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.

The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.

2.09 PIPING: REMOVAL

A. General: Provide labor, materials, and equipment necessary to remove piping indicated to include pipe, fittings, supports, hangers, attachments, and insulation. Remove debris associated with pipe removal from the project site. Maintain clean workspaces.

B. Coordination: Coordinate interruptions of service with Owner and Architect.

2.10 PIPING: SYSTEM TESTS

A. Provide labor, instruments, and equipment necessary to complete all tests.

B. Maintain a log of tests with dates, times, and type of test. Leaks found during testing periods shall be noted, identified, and corrected.

2.11 SUPPORTS: PIPE HANGERS:

A. General: Provide pipe supports, hangers, or other appurtenance to firmly support the piping systems. All pipes shall be independently supported from the building structure and not from other pipes, flues, conduits, ducts or pipe hangers, etc.

B. Refer to Section 23 02 50 – MECHANICAL PIPE HANGERS AND SUPPORTS for pipe hanging requirements.

C. All pipe hangers and supports shall be of stainless-steel construction.

2.12 VALVES: DOMESTIC WATER

A. General: Provide valves where indicated and as required for proper isolation and operation of the domestic water distribution system. Provide shut off valves on all piping serving system risers, equipment, fixtures or banks of fixtures, and at wall hydrants.

Valves shall be designated for 125 psi working pressure unless noted otherwise.
Valves 2-1/2" and smaller shall be bronze or brass.

B. Valves shall have the name or trademark of the manufacturer and the guaranteed working pressure cast on the body of the valve. Valves shall be as manufactured by Milwaukee, Stockham, Crane or Nibco. Valves for the project shall be the product of one manufacturer.

Ball Valves, Class 150: 1/4" to 2" cast bronze 600# W.O.G., full port, screwed ends.

All valves to be installed within insulated pipeline shall be provided complete with valve stem extensions. Stem extensions shall be 2” minimum.

Milwaukee	BA-300
Apollo	77-14
Nibco	T-585-70

Drain Valves: 1/4" to 2" cast bronze 600# W.O.G., full port, screwed ends w/ capped hose end, chain and cap.

Milwaukee	BA-1001T
Apollo	78-100

2.13 TRAPS:

A. Every plumbing fixture without a manufacturer’s integral trap shall separately trapped by a water seal type trap. The vertical distance between the fixture outlet and the trap weir shall not exceed 14 inches. Plumbing fixtures shall not be double trapped.

B. Each fixture trap shall have a liquid seal of not less than 2” and not more than 4”. (Deeper trap seals may apply to special designs for accessible fixtures.)

C. Where trap seals are subject to loss by evaporation, deep seal type traps shall be used.

D. All floor drains shall be provided with deep seal type traps.

2.14 SLEEVES, PLATES:

A. Provide and locate sleeves, plates, anchors, and inserts required; mark openings before floors and walls are constructed or core bored.

B. Provide sleeves for piping passing through floors, walls, roofs, partitions and masonry. Sleeves for concrete or masonry shall be Schedule 40 steel pipe of size to allow for pipe expansion and passage of vapor barrier insulation. Other sleeves shall be 20 gauge galvanized sheet steel with lockseam joint.

1. Terminate sleeves flush with walls, partitions, and ceiling.
2. Terminate sleeves 1/2" above finished floor where piping is exposed.

C. Where ceiling inserts are provided specifically for the use of the Owner, install all work, so as to not interfere, with a separate support system.

2.15 FIRE SAFING: PIPING AND EQUIPMENT OPENINGS:

A. Refer to Section 23 03 00 – MECHANICAL: FIRE SAFING, for requirements.

2.16 UNIONS:

A. Provide union connections at equipment and as indicated. Unions 2" and smaller shall be wrought copper sweat type; larger shall be wrought copper flange type.

2.17 SANITARY SYSTEM CLEANOUTS:

A. Provide cleanouts at all changes in direction, at intervals as required by Code, and as indicated.

B. Wall Cleanout: Provide with cast iron supreme cleanout with cadmium plated plug, lead seal, and round stainless steel access cover with securing screw.

Model:	ZN-1445	With Z-1462 8x8 access
Model:	ZN-1446	With round wall access

PART 3 - INSULATION: PRODUCTS AND INSTALLATION

3.01 INSULATION: GENERAL:

A. Provide all insulation as specified in a neat and workmanlike manner observing the best practices of the trade. All longitudinal seams shall be flat and facing away from view. Insulation shall be smooth throughout. Vapor barriers, where required, shall be continuous. No raw ends of material shall be permitted; cover same with eight ounce canvas or approved equal.

B. Piping and equipment shall be insulated as specified within Section 23 04 00 – MECHANICAL INSULATION.

PART 4 – EQUIPMENT / APPURTENANCES

4.01 ACCESS PANELS:

A. Provide coordination to properly locate panels that are provided within other sections of this Specification.

4.02 VACUUM BREAKERS:

A. Provide approved vacuum breakers at all service sinks and wherever required by governing codes.

B. Provide Watts #288 or approved equal vacuum breaker at hot water heater.

4.03 PRESSURE REDUCING VALVE:

A. Provide pressure-reducing valve at building water service entrance if the supply pressure is in excess of 80 psig. Unit to be preset for 75psig.

Model: Watts U5 BG or approved equal.

4.04 FLOOR DRAINS:

A. Provide floor drains as indicated as manufactured by Zurn, Josam or Smith. Zurn model numbers are used to set standards.

B. Refer to the SCHEDULE on the Drawings for the type and models of floor drains to be provided.

C. All floor drains shall be fit with "Sure Seal" trap sealing devices as manufactured by Rectorseal. Trap sealing devices shall be ASSE 1072 and IPC approved.

4.05 FLOOR SINKS:

A. Provide floor sinks as indicated as manufactured by Zurn, Josam or Smith. Zurn model numbers are used to set standards.

B. Refer to the SCHEDULE on the Drawings for the type and models of floor sinks to be provided.

C. All floor sinks shall be fit with "Sure Seal" trap sealing devices as manufactured by Rectorseal. Trap sealing devices shall be ASSE 1072 and IPC approved.

4.06 INSIDE SILL FAUCET:

A. Provide inside sill faucet with vacuum breaker, threaded hose outlet, tee handle, chrome plated, as manufactured by Chicago Faucet Co or approved equal.

Model: Chicago Model #952

4.07 BACKFLOW PREVENTER:

A. General: Provide backflow preventers at all connections to the public water supply. Backflow preventers shall carry the approval of the UPC, The American Society of Sanitary Engineering, UL and FM.

B. 2" and Smaller: Backflow prevention systems shall be comprised of all bronze construction. Housed within a single body shall be two check valves with removable seats, and a pressure relief valve with stainless steel seat. The backflow preventer assembly shall be isolated between two full ports, quarter turn, bronze body ball valves.

C. Manufacturer's Data: Backflow preventers shall be Series 009, as manufactured by Watts. Equal products as manufactured by Hersey or Wilkins are acceptable.

D. Provide drain piping to nearest floor drain.

4.08 CONNECTIONS TO KITCHEN EQUIPMENT:

A. Provide labor and materials to install and/or connect to kitchen equipment furnished to the project under other sections of the specification. Refer to the drawings for the required scope of work.

4.09 WATER HAMMER ARRESTORS:

A. Provide water hammer arrestors, in domestic water piping systems, properly sized, with adapters, and with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Both casing and bellows constructed of Type 18-8 stainless steel.

   Model: Z -1700 “Shoktrols” or equal models by J R Smith or Watts

B. Provide complete submittal with models, sizes and locations for all arrestors.

C. Locations: Provide arrestors at:

   At all electric solenoid automatic valve locations.

   At all banks of three or more fixtures.

D. Coordinate the location of properly sized access panels with the arrestor location to assure proper access.

4.10 DOMESTIC WATER EXPANSION TANK

A. Provide a potable, domestic water expansion tank on the supply line to the hot water heater. Unit shall be of steel construction, with rigid polypropylene reservoir liner, butyl diaphragm separating the air chamber from the domestic water, stainless steel lined inlet connector, FDA approved materials, field adjustable air pressure charge and with ¾” male connection.

B. Refer to the Drawings for size and models required.

4.11 HOT WATER TEMPERING VALVE, THERMOSTATIC MIXING VALVE; POINT OF USE:

A. General:

   Provide point of use type thermostatic mixing valves where indicated on the Drawings.

   Water temperature limiting valve including integral checks and dual stainless steel strainers for double protection against suspended particles in supply lines. Valve made from lead free* metal components.

   Temperature control range:

   60°F - 140°F (15.6°C - 60°C)

   Minimum supply pressure:

   20 psi (138 kPa)

Maximum supply pressure:

125 psi (862 kPa)

Inlet to outlet temperature differential:

10°F (5.55°C)

Model:

Hot Water Tempering Valves shall be Model 7-225-CK-MS for ½" line size or Model 7-230-CK-FS for ¾" line size.

Thermostatic Mixing Valve shall be as manufactured by Symmons, or Engineer approved equal as manufactured by Leonard or Lawler.

Finish:

Standard rough bronze and copper finish.

Testing:

Factory assembled and tested.

Installation:

The thermostatic mixing valve must be piped in strict accordance with the manufacturer's recommendations.

4.12 INSTANTANEOUS TYPE GAS FIRED WATER HEATER:

A. General:

Provide instantaneous type gas fired domestic water heaters capable of firing with LP Gas. Units shall be of Model and Capacity as indicated in the schedule and shall be complete with all operating controls required to allow modulating, cascading firing as required to follow the domestic hot water heating demand. Heater shall be as manufactured by Rinnai or approved equal.

Water Heater(s) shall be internally mounted, commercial condensing, multiple point-of-use, gas fired, direct vent, water heater(s) design certified to the ANSI Z21.10.3 standard for gas fired water heaters.

Water Heater(s) shall have a commercial energy star rating.

Water Heater(s) shall have a thermal efficiency of 96% and a Uniform Energy Factor of 0.93.

Each Water Heater shall produce no more than 20 ppm NOx emissions when tested in accordance with the Rules and Regulations of the South Coast Air Quality Management District (SCAQMD).

Water Heater(s) shall be configured to operate with propane and a 120 volt/60 Hz AC power source.

Water Heater(s) shall have a BTU input range of 15,000 BTU/hr to 199,000 BTU/hr, and a maximum hot water outlet capacity of 9.8 gallons per minute (with a 30 °F temperature rise).

Water Heater(s) shall be microprocessor controlled and utilize a direct electronic ignition system (with no standing pilot), fully modulating gas control valve, turbine flow meter, automatic electro-mechanical water flow control valve, and water temperature thermistors to maintain outlet water temperature between ± 2 °F of set point temperature. Microprocessor shall have built in recirculation logic to control a pump's heating cycles.

Water Heater(s) shall incorporate the following internal safety devices: flame failure lockout, boiling protection lockout, thermal overheat protection, internal freeze protection for ambient temperatures as low as –22 °F, and lockout protection in the event of a blocked flue.

Water Heater(s) shall be provided with a temperature thermostat with an adjustable set point range of 98 °F to 185 °F.

Water Heater(s) shall also be capable of storing and displaying a history of up to 9 diagnostic maintenance codes, via the display on the temperature thermostat controller.

Water Heater(s) shall have downward fired fiber mesh burners, solid brass water flow control valve, and solid brass inlet and outlet water connections.

Water Heater(s) shall have a primary stainless steel heat exchanger and a secondary stainless steel heat exchanger warranted against material defects or workmanship with coverage as follows:

Heat Exchanger: 8 years or 12,000 operation hours, whichever occurs first
All Other Parts and Components: 5 Years
Reasonable Labor: 1 Year

4.13 AUTOMATIC GREASE REMOVAL DEVICE: (Grease Trap):

A. Provide Package type grease removal device as manufactured by Thermaco Big Dipper. Unit shall be of capacity and model as indicated in the SCHEDULE on the Drawings.

B. The grease removal device shall have a bright finish type 304 stainless steel exterior, rotationally molded polyethylene interior automatic self-cleaning grease and oil recovery separator(s) for floor mounted or partially recessed installation.

C. Unit shall be rated to ASME A112.14.3 and/or PDI-G 101 standards at 50 gallons per minute (3.15 l/s) peak flow, 108 pounds (49.2 Kg) of grease capacity.

D. The unit shall include as an integral part of the unit, 3" (75 mm) inlet/outlet, 1 rotating gear oleophilic/hydrophobic skimming wheel assembly for automatic grease/oil removal, flow control device, self-regulating electric immersion heater with thermostatic control, 1" (25mm) vessel vent, integral gas trap.

E. Control shall be digital for programmable operation with field reversible motor assembly.

F. Unit casing shall be with grease/oil sump outlet, quick release stainless steel lid clamps, fully removable integral polymer/304 grade stainless steel lid with magnetic lid tensioners, internal stainless steel strainer basket for collection of coarse solids, polymer wiper blade unit and a separate gasketted removable grease and oils collection container with carry handle and pouring spout.

G. Electric assembly shall be tested to comply with pertinent sections of the Standards for Safety ANSI/UL 73 and/or ANSI/UL 1004. Electric motor equipped with overload protection.

H. Two (2) no-hub connectors for plumbing connection shall be provided.

END OF SECTION 23 10 00

SECTION 23 15 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 10 00 PLUMBING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared and submitted for approval within the time period stated (see SCHEDULE OF SUBMISSIONS in Section 23 00 00): (The list below is not intended to all inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Plumbing Fixtures
Fixture Trim

1.06 PROJECT CLOSE-OUT:

A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Operating, Maintenance Instructions
Written Guarantee
Lubrication
Operating, Maintenance Manuals
Cleaning

PART 2 - FIXTURES AND INSTALLATION

2.01 FIXTURES: GENERAL

A. The arrangement and quantity of plumbing fixtures shall be as indicated on the Architectural Drawings.

B. Provide fixtures, carriers, brass and appurtenances complete with trimmings ready for use.

C. Securely support fixtures from the building structure in a rigid manner. Provide hangers, frames, and carriers for proper installation. Wall hung fixtures shall be set tight to wall.

D. Protect all fixtures during construction and thoroughly clean at project closeout.

E. Air Gap: Provide only fixtures with an air gap between the level of supply openings and the level at the point of unrestricted external overflow.

F. Domestic water hot and cold water supplies shall be arranged with cold on the right and hot on the left. Faucets shall be indexed to indicate H and C.

2.02 WATER FLOW RATE:

A. General: Fixtures shall be limited to a flow rate of 1.6 gpm at 80 psig unless noted otherwise.

B. Public facilities:

Lavatories in restrooms of public facilities shall be equipped with faucet outlet devices that limit the flow to a maximum rate of .5 gpm.

Water closets shall use a maximum of 1.6 gallon per flushing cycle.

2.03 FIXTURES: MANUFACTURERS

A. General: Plate numbers and manufacturer's names used in the Schedule establish type and quality required.

B. Manufacturers:

Vitreous China	American Standard Kohler Zurn Toto
Brass	Chicago Zurn Symmons Moen
Toilet seats	Church American Standard Zurn
Stainless steel sinks	Elkay Just

2.04 FIXTURE INSTALLATION:

General: Review all drawings and determine the mounting locations and heights. All fixtures intended for handicapped use shall be mounted to suit requirements. Provide carriers and wall supports for the proper mounting height and type of construction indicated. For all exposed hot water piping and drains at fixtures provide insulation as specified and / or required.

Review the installation of all fixtures to insure proper clearances. If necessary, request additional detail data prior to the installation of fixtures.

2.05 CARRIER SYSTEMS:

Provide fixture carrier systems as indicated at fixtures. Carriers shall be installed per manufacturer's recommendation and shall be secured to the building with adequate fastening systems.

Manufacturers:	Zurn; or equal system of; Smith Josam
Wall hung Lavatory:	Use Zurn system Z1231 or Z1236

2.06 PLUMBING FIXTURES: SCHEDULE

A. Provide fixtures as indicated. Shop drawings are required. China fixtures are white unless indicated otherwise.

<u>P-1 Water Closet: (Floor Mounted, Pressure Assisted Tank, 17" Handicapped Use)</u>

2467.016 "Cadet Right Height Elongated Toilet" floor mounted, 16-3/4" rim, vitreous china elongated

bowl, pressure assisted siphon action water closet, white, 1.6 GPF
5324.019 Rise and Shine seat with cover
3/8" CP supply with stop
Bolt hole covers
Wax ring gasket

P-2 Lavatory: (Wall hung, Handicapped Use)

0355.027 "Lucerne" 20.5" x 18.25"
Symmons SLC-6000 "Scot" Metering Lavatory Faucet

- 4" centerset mount
- 3/8" copper supply tubes and temperature limit stop
- Vandal resistant 0.5 gpm (1.9 L/min) aerator limits water flow to a maximum of 0.25 gpc (0.95 L/cyl) @ 60 psi with a maximum 30 second closing time.

Faucet constructed from brass, plated in standard polished chrome finish.

3/8" CP angle supplies with stops
1-1/2" CP P-trap with clean out
Wall carrier.

Provide Handi-Lav-Guard insulation including angle valve and P-trap assembly.

Truebro Model #101

P-3 Mop Receptor:

MSB-2424 Fiat: Molded stone mop receptor with cast brass drain fitting and stainless steel strainer. #E-77-AA bumper guard. #231 White drift.
830-AA Service faucet with vacuum breaker
832-AA Hose
889-CC Mop hanger

P-4 Kitchen Hand Sink (Stainless steel, wall mounted)

SSP Elkay wall mounted stainless steel hand sink with backsplash, complete with the following:

- 18 Gauge, 300 series stainless steel
- 6" Backsplash with 2" return
- Goose neck faucet
- 1-1/2" Drain opening
- Strainer included
- Z-clip mounting bracket

3/8" CP angle supplies with stops
1-1/2" CP P-trap with clean out

P-5 Kitchen Sink (Stainless steel, scullery)

SSP 14-3C1824-2-24X scullery sink with 18 x 24 compartment, 24" drainboards on right and left. Satin finish, configured as follows:

14" Standard Series Sink, with three compartments, both le_ and right drainboards, 9" backsplash, 16 gauge, 300 series stainless steel top and bowl, galvanized legs & adjustable feet, raised 1-1/2" rolled edge, includes 3-1/2" basket strainer, NSF approved.

Sink shall be complete with the following features:

- 16 Ga. stainless steel Welded construction for consistent metal gauge thickness throughout
- 14" (355.6 mm) deep tub with 3/4" (19.1 mm) coved radius tub corners
- All drainboards are die stamped for positive drainage
- 9" (228.6 mm) backsplash with tile ledge for easy installation
- Raised 1-1/2" (38.1 mm) rolled edge
- 3-1/2" (88.9 mm) drain with basket strainers included
- 1-5/8" (41.3 mm) galvanized legs with 1" (25.4 mm) adjustable plastic feet
- 2" (50.8 mm) divider between each tub

Elkay Model LK943AF08C Pre-rinse faucet with flexible spray head, divertor valve and swing spout. 8” center set for back mounting

½” supplies with stops
2" continuous waste with clean-out.

2.07 KITCHEN FIXTURES: SCHEDULE

A. Provide connections as indicated to the following kitchen fixtures. Fixtures will be provided by others.

K-3 Batch Freezer:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

¾” indirect waste connection. Route indirect waste to discharge above nearest floor drain

K-13 Countertop Griddle:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

Valved LP gas connection with flexible appliance connector. Refer to drawings for connection size required. Routing and required length of flexible connector to be field coordinated.

K-14 Countertop Char-Broiler:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

Valved LP gas connection with flexible appliance connector. Refer to drawings for connection size required. Routing and required length of flexible connector to be field coordinated.

K-16 Deep Fryer:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

Valved LP gas connection with flexible appliance connector. Refer to drawings for connection size required. Routing and required length of flexible connector to be field coordinated.

K-20 Hot Food Table:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

1” indirect waste connection. Route indirect waste to discharge above nearest floor drain

K-26 Ice Maker with Bin:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

One 3/4” indirect waste connection and One 3/8” indirect waste connection. Route indirect waste to discharge above nearest floor drain

3/8” valved cold water connection via K-36 Water Treatment Unit.

K-36 Water Treatment Unit:

Provide all labor and material required to connect this fixture, provided by others, to the plumbing system as noted:

½” valved inlet cold water connection and 3/8” valved cold water outlet connection to K-26 Ice Maker with Bin.

END OF SECTION 23 15 00

SECTION 23 17 00
PLUMBING, NATURAL GAS PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 02 50	MECHANICAL: PIPE HANGERS AND SUPPORTS
Section 23 03 00	MECHANICAL: FIRE SAFING / FIRESTOPPING
Section 23 04 40	MECHANICAL: PIPE CLEANING TESTING
Section 23 10 00	PLUMBING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

B. Work specified within this Section is limited to 5’-0” beyond building limit.

C. Work required beyond 5 ft. form building limit is specified within Division 33 SITE UTILITIES, PIPING.

1.03 REFERENCES:

A. The current editions of the following standards are a part of this specification.

ASME B1.1	Unified Screw Threads
ASME B16.3	Malleable Iron Thread Fittings Classes 150 and 300
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory made Wrought Steel Butt Welding Fittings
ASME B16.11	Forged Fittings, Socket Welding and Threaded
ASME B16.33	Manually Operated Metallic Gas Valves
ASTM A53	Pipe, Steel, Black, and Hot Dipped, Zinc Coated Welded and Seamless
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel
ANSI Z223.1	National Fuel Gas Code (NFPA 54)

IFG 2003 International Fuel Gas Code 2012

1.04 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.

1.05 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.06 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared (see Section 23 00 00) and submitted for approval within the time period stated: (This listing is not intended to be all-inclusive. Provide submittals for all materials and equipment proposed for use on this project.)

Pipe and fittings
Valves, cocks, unions
Piping specialties
Gauges and instrumentation
Pipe hangers, supports

1.07 PROJECT CLOSEOUT:

A. Review and provide closeout requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Record Drawings
Operating, Maintenance Instructions
Written Guarantee
Operating, Maintenance Manuals
Cleaning

Test Log
Letters of compliance.

PART 2 - PIPING PRODUCTS AND INSTALLATION

5.02 PIPING: INSTALLATION, GENERAL:

A. Arrange and install piping approximately as indicated and as straight, plumb, and direct as possible. Form right angles or parallel lines with building wall. Keep pipe close to walls, partitions and ceilings. Offset only where necessary to follow walls. Where so indicated and wherever possible, conceal piping in building construction before erection of closing construction. When furred spaces are indicated, keep pipes as close to structural members as possible. Piping shall not interfere with openings, doors and windows. Allow for proper clearance at windows, doors, equipment and other building parts such that piping does not interfere with access and building use.

B. Piping shall be cut accurately to measurements established at the site and shall be installed without springing, forcing and excessive cutting or weakening of building structure. Pipes shall be installed in a manner permitting proper drainage, venting and free expansion and contraction. Changes in direction shall be made with factory-manufactured fittings.

C. Piping shall not be permitted to be installed within or below floor slabs.

D. Piping within solid walls shall not be permitted unless installed in chase.

E. Piping shall not penetrate any air ducts, chutes, stairwells or shafts

F. Install pipe to allow for expansion without excessive stress on pipe, hangers and building.

G. Arrange piping passing through floors, walls and other partitions of building construction so that piping is centered in openings / sleeves and is rigidly supported on both sides of openings / sleeves.

H. Clean pipe, pipe fittings, and valves before erection. Cap or plug open ends of piping and equipment during construction to keep dirt and foreign material out of system.

I. Before installing, clean black steel pipe and fittings by hammering to loosen scale and rust and flush out with water, or blow out with compressed air or high-pressure steam under controlled safe conditions.

J. Perform additional cleaning of piping systems as specified in related Sections.

K. After threading steel pipe, clean pipe ends carefully to remove cutting oil and metal particles.

L. Unions or flanges shall be used to facilitate piping installation, and shall be installed between shut-off valves and equipment to facilitate removal of equipment for repair.

M. Provide dielectric unions where pipes of dissimilar metals are joined together.

N. Branch piping connections from mains to fixed equipment, and connections from risers to horizontal mains, shall have a minimum of three (3) 90 degree elbows and be arranged in swing fashion to permit unrestricted expansion and contraction of piping and minimize stress at connections to risers and fixed equipment.

O. Do not route pipelines over switchboards, panels, motor control centers, individual motor starters and other electrical equipment.

5.03 PIPING: BUILDING SERVICE ENTRANCE

A. LP gas service to the building will be provided by the Owner's LP Gas Vendor. Coordinate with the regulator location and layout. Review site drawings.

B. Piping shall enter the building at a minimum of 20" above grade. Provide steel or cast iron sleeve full depth of the building wall with a ¼" annular space to the piping. Pack annular space with oakum and seal both ends with silicone waterproof construction sealant.

5.04 PIPING: FUEL GAS (NATURAL GAS) 2" and smaller

A. Scope: Interior of building above grade.

B. Material: Provide Schedule 40 black steel pipe, seamless Type S or welded Type E, ASTM A53/A52M with 150 psi banded malleable screw fittings ASME B16.3.

C. Joints: Ream pipe to full inside diameter. Join pipe with teflon tape or joint compound applied to male threads only, in accordance with procedure in U S A Piping Code.

D. Installation: All piping shall be pitched towards drip legs (6" deep scale pockets with removable cap).

E. Drip Legs: Provide full size drip legs at all low points and at connections to equipment. Length to be 6 pipe diameters minimum.

F. Pressure Test: Pneumatic test all piping to a minimum of 30 psig for a period of 4 hours without a loss of pressure.

5.05 EQUIPMENT CONNECTIONS:

A. Coordinate and insure that all equipment is provided with proper gas pressure regulators.

B. In general the building system supply pressure at the service will be set to 6"WC unless specifically required to be higher.

C. Install unions at connection to all equipment downstream of isolation valves and dirt legs.

5.06 APPLIANCE CONNECTORS:

A. For appliances operating at less than 0.5 psig provide stainless steel or coated stainless steel corrugated ANSI Z21.24 Connectors For Gas Appliances.

Brasscraft or approved equal

5.07 FLEXIBLE CONNECTORS:

Flexible Connectors:	ANSI Z21.45
Quick Disconnect Couplings	ANSI Z21.41

Semi Rigid Tubing and Fittings ANSI Z21.69

5.08 PIPE IDENTIFICATION

A. Coordinate with other requirements of these specifications to insure that piping is labeled as required.

5.09 VALVES:

A. Provide valves where indicated and as required for proper operation of the system. Provide throttling valves where regulation of flow is necessary or desirable, check valves where reverse flow is liable under any condition and shut-off valves on all lines connecting to any piece of equipment.

Valves shall be a minimum of 125# standard construction unless noted otherwise.
Valves 2-1/2" and smaller shall be bronze or brass.

B. Valves shall have the name or trademark of the manufacturer and the guaranteed working pressure cast on the body of the valve.

Manufacturer: Stockham
Milwaukee
Crane
Nibco
Apollo.

C. LP Gas Service:

Gas Shut-Off: 1/2" to 2" cast bronze 600#, screwed ends, Ball Valve.

Milwaukee	BA-485
Watts	6000-UL
Nibco	T-176-A

5.10 UNIONS:

A. Provide unions at all equipment connections, and also where indicated, and as required to make future repairs:

Unions 2" and smaller: ASME B16.39 Black malleable iron
Unions larger shall be flanged:

Manufacturers: Stockham, Grinnell;

5.11 DIELECTRIC UNIONS, FLANGES, HANGERS:

A. Where dissimilar metals connect, provide dielectric unions, dielectric flanges or hangers to prevent electrolysis.

5.12 SLEEVES: PIPE

A. Walls: Where piping penetrates masonry or concrete walls, provide sch 40 steel pipe sleeve flush with wall, of size to allow passage of pipe insulation.

B. Floor: Where piping penetrates floor, provide sch 40 steel pipe sleeve extending 1/2" above finished floor, of size to allow passage of pipe insulation.

C. Fire Stop: Pack sleeve openings full depth with glass wool to seal opening.

5.13 SUPPORTS: PIPE HANGERS:

A. General: Provide pipe supports, hangers, or other appurtenance to firmly support the piping systems. All pipes shall be independently supported from the building structure and not from other pipes, flues, conduits, ducts or pipe hangers, etc.

B. Refer to Section 23 02 50 – MECHANICAL PIPE HANGERS AND SUPPORTS for pipe hanging requirements.

5.14 PIPING IDENTIFICATION:

A. Provide pipe identification as specified within Section 23 00 00 MECHANICAL GENERAL REQUIREMENTS.

5.15 AUTOMATIC MECHANICAL GAS SHUT DOWN VALVE:

A. Provide labor and material to properly install the mechanical gas shut down valve provided by the Kitchen equipment provider. Valve shall be located after manual isolation valve on gas supply piping to all equipment under the hood. Valve is to close whenever hood suppression system is in alarm or whenever the manual emergency station is activated.

5.16 KITCHEN EQUIPMENT CONNECTIONS:

A. Provide all labor and materials to connect kitchen equipment furnished by others. Provide isolation shut off cock for each separate supply with flexible connection piping to equipment.

END OF SECTION 23 17 00

SECTION 23 80 00
HVAC: AIR HANDLING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 00 50	MECHANICAL: ELECTRICAL COMPONENTS
Section 23 01 50	MECHANICAL: VIBRATION ISOLATION
Section 23 02 50	MECHANICAL: PIPE HANGERS AND SUPPORTS
Section 23 03 00	MECHANICAL: FIRE SAFING / FIRESTOPPING
Section 23 04 00	MECHANICAL: INSULATION
Section 23 85 00	HVAC: EQUIPMENT
Section 23 95 00	HVAC: TESTING ADJUSTING BALANCING

1.02 SCOPE:

A. Provide labor, equipment and materials to complete the work indicated on drawings and herein specified.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:

Cutting, Patching, and Painting
Openings in roofs / Flashing
Openings in walls
Equipment foundations and bases
All temporary heating

Electrical Contractor:

Power wiring for electrical equipment provided within this section.
All duct smoke detectors that are a part of the fire alarm system.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

B. Prepare and transmit to the Architect all submittal requirements within the time period allowed. See Schedule of Submissions.

1.05 SUBMITTALS:

A. See SUBMITTAL GENERAL REQUIREMENTS within Section 23 00 00.

B. The following shop drawings shall be prepared (see Section 23 00 00) and submitted for approval within the time period stated: (This listing is not intended to all inclusive – provide submittals for all materials and equipment proposed for use on this project)

Air Handling Ductwork Layout Drawings

Air Handling Ductwork Materials

Stainless Steel Hood Exhaust

Duct Access Panels

1.06 PROJECT CLOSE-OUT:

A. Review and provide close-out requirements of this section and Section 23 00 00 Mechanical General Requirements, including:

Testing and Adjusting
Record Drawings
Operating, Maintenance Instructions
Written Guarantee
Lubrication, Filters
Operating, Maintenance Manuals
Cleaning
Test Log
Letters of compliance.

PART 2 - PRODUCTS AND INSTALLATION

2.01 DUCTWORK: GENERAL

A. Provide all labor, materials, equipment, and supplies to fabricate and install all duct systems, including ductwork, fasteners, hangers, braces, caulking, fire stopping, access doors, flexible connections and all other items necessary and required for a complete and economically operated system as indicated.

B. Provide all labor, materials and supplies to properly install devices in the ductwork, including but not limited to; sensors, fire alarm equipment, control equipment, smoke detectors, flow devices, provided within other sections of the specifications. This work shall be coordinated and installed as required for proper operations.

C. Unless otherwise stated or indicated all ductwork shall be constructed following SMACNA standards.

D. Maintain the cleanliness of the duct storage and installation work area such that the duct systems are internally clean. Provide temporary mylar caps during construction to insure that construction dust does not enter the duct systems. All duct openings shall be sealed until connected to equipment. Wipe down all exterior surfaces as necessary prior to project completion.

2.02 DUCTWORK: KITCHEN HOOD DISCHARGE

A. General: Provide discharge duct from kitchen hood to exhaust fan in accordance with the International Mechanical Code (latest edition), NFPA-96 and as indicated.

B. Construction: Provide 18 gauge stainless steel duct with liquid tight welded connections and joints. Duct shall be installed directly to outside with curved elbows and without pockets for grease accumulation. Provide residue trap at base of vertical rises with access door for cleaning. Provide proper clearances to all construction.

2.03 ACCESS DOORS - DUCTWORK:

A. Provide in all ducts where indicated for cleaning access with continuous hinge and cam lock, or double cam lock if necessary. Units shall be gasketed and of stainless steel construction to match kitchen hood exhaust duct system.

B. Units sizes shall be determined by duct size, and purpose of accessibility. All fusible links shall be readily accessible. Access door shall be sized at coils such that door is not less than 6" less than duct size.

2.04 FIRE STOPS: DUCTWORK

A. Where ducts penetrate walls, floors; seal the space around the duct full depth with mineral wool or other non-combustible material. For oversized openings provide sheet metal closure to hold material in place as necessary.

PART 3 INSULATION PRODUCTS AND INSTALLATION

3.01 INSULATION: GENERAL:

A. Provide all insulation as specified in a neat and workmanlike manner observing the best practices of the trade. All longitudinal seams shall be flat and facing away from view. Insulation shall be smooth throughout. Vapor barriers, where required, shall be continuous. No raw ends of material shall be permitted; cover same with eight ounce canvas or approved equal.

B. Ductwork and equipment shall be insulated as specified within Section 230400 – MECHANICAL INSULATION.

END OF SECTION 23 80 00

SECTION 23 95 00 – HVAC TESTING ADJUSTING BALANCING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01 and the following listed sections as a minimum, apply fully to work in this section.

Section 23 00 00	MECHANICAL GENERAL REQUIREMENTS

B. Refer to and coordinate all work with the work of the following listed Sections:

Section 23 80 00	HVAC: AIR HANDLING SYSTEMS
Section 23 85 00	HVAC: EQUIPMENT

1.02 SCOPE:

A. Provide for an independent balancing concern to provide labor, equipment and materials to complete the Balancing Adjusting Testing of the heating, ventilating and air conditioning system including temperature controls, and interrelated equipment indicated.

B. This Section specifies the requirements and procedures for testing, adjusting, and balancing air and water distribution systems. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications and recording and reporting the results.

C. Testing, adjusting and balancing is the process of checking and adjusting mechanical system parameters to produce the design objectives. It includes:

Balancing of air distribution systems

Adjustment of the total systems to provide the design quantities.

Electrical measurement.

1.03 RELATED WORK:

A. Work in conjunction with this section shall be as designated below:

General Contractor:	Access to all equipment coordination.
HVAC Contractor:	Provide coordination and data on equipment furnished.

1.04 PROJECT ADMINISTRATION:

A. Transmit questions, submissions, notices, and correspondence through the general contractor for transmittal to the Architect.

1.05 NOTIFICATION / COORDINATION:

A. The balancing concern shall *notify the Engineer at all times when balancing is to be performed*. The general contractor and the HVAC contractor shall insure that all systems are ready for balancing/final adjustment prior to notification of the balancing concern to proceed.

B. Systems shall be fully operational prior to beginning testing, adjusting, and balancing procedures.

1.06 SUBMITTALS REQUIRED:

A. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

B. Engineer and Technician Data: Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this data in the maintenance manual.

E. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems.

1.07 SCHEDULE OF SUBMISSIONS:

A. Balancing Report Prior to substantial completion. 3 Copies.

1.08 QUALITY ASSURANCE:

A. Agency Qualifications:

Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting results.

The independent testing, adjusting, and balancing agency shall be certified by NEEB, TAB and/or SMACNA in those disciplines required for this Project.

B. Codes and Standards:

NEBB: “Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems”.

ASHRAE: ASHRAE Handbook, 1987 Systems Volume, Chapter 57; Testing, Adjusting, and Balancing.

1.09 BALANCING CONCERN:

A. Selection of the Subcontractor for this work shall be subject to the Owner’s approval.

B. Select from the following:

Leonhardt Company, 27 Harvard Street, Brookline, MA
Arden Engineering Service Group, 435 Narragansett Park Dr. Pawtucket, RI.
Thomas-Young Associates, Inc., P.O. Box 567, Marion, MA 02738 (508 748 0204)
Kyle Baker Associates, Poccasett Ave, Providence

1.10 DEFINITIONS:

A. Adjust: To regulate the specified fluid flow rate at the terminal equipment.

B. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

C. Branch: Duct or pipe serving a single terminal.

D. Branch main: Duct or pipe serving two or more terminals.

E. Main: Duct or pipe containing the system’s major or entire fluid flow.

F. Procedure: Standardized approach and execution of a sequence of work operations to yield reproducible results.

G. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These forms should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

H. Submain: Duct or pipe containing part of the system’s capacity and serving two or more branch mains.

I. Terminal: The point where the controlled fluid enters or leaves the distribution system.

J. Test: To determine the quantitative performance of equipment.

1.11 COSTS:

A. Carry the amount proposed from anyone of the listed firms as a part of the base bid. Indicate with the bid which of the listed firms is included within the base bid.

PART 2 – BALANCING / FINAL ADJUSTMENT

2.01 GENERAL:

A. Test, adjust and balance the systems provided to achieve design operation and to set and mark all adjustable equipment for economical operation.

B. Obtain design drawings and specifications for the project and become thoroughly acquainted with the design intent.

2.02 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

A. Before operating the system, perform the following steps:

Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.

Check filters for cleanliness.

Prepare report test sheets for both fans and outlets. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

Determine best locations in main and branch ductwork for most accurate duct traverses.

Prepare schematic drawing of system ductwork and piping layouts to facilitate reporting.

Lubricate all motors and bearings.

Check fans for proper direction of rotation.

Check fan belt tension.

2.03 SYSTEM TESTS, GENERAL:

A. Scope: Subsequent to final Testing Adjusting and balancing, all control systems shall be adjusted and calibrated such that performance of all equipment is operating as intended.

2.04 MEASUREMENTS, INSTRUMENTS AND SUPPLIES:

A. Provide all required instrumentation to obtain proper measurements. Instruments shall meet the requirements specified in the referenced standards, and shall be calibrated to the tolerances specified therein. Instruments shall be properly maintained and protected against damage.

B. Use only those instruments that have the maximum field measuring accuracy and are best suited to the measurement being made.

C. Apply each instrument as recommended by the manufacturer.

D. Use instruments with the maximum number of scale subdivisions and with the minimum scale range for the value being measured.

E. When averaging values, take a sufficient number of readings to give a repeatability error of less than 5%. When measuring a single point, repeat readings until two consecutive identical readings are obtained.

F. Take all readings with the eye at the level of the indicated value to prevent parallax.

G. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuating readings.

H. Take measurements at locations that will render the most accurate data.

2.05 AIR FLOW BALANCE; GENERAL:

A. Scope: After the completion of the air distribution systems, adjust and balance the systems to deliver air quantities as indicated or as directed.

B. Perform testing, adjusting, and balancing procedures on each system identified in accordance with the detailed procedures outlined in the referenced standards.

C. Preliminary Procedures:

Adjust and balance flows to specified design quantities with a tolerance of +/- 5%.

Adjust and balance exhaust airflow for system.

Cut insulation, ductwork, and piping for the installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

Patch insulation, ductwork, and housings using materials identical to those removed.

Seal ducts and test for and repair leaks.

Seal insulation to re-establish integrity of vapor barrier.

Mark equipment settings of controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

D. Instruments: Calibrate and maintain all instruments used in checking, balancing the system. Perform accuracy tests on instruments whenever requested by Owner, Engineer, or Architect.

E. Air Measurement: Measure air quantities in main ducts by pitot tube traverse of the entire cross section area of the duct. Openings in ducts for tests shall be sealed. Outlet and inlet air quantities shall be determined by direct reading velocity meters.

F. Air Quantity Adjustments: Total air quantities shall be obtained by adjusting fan speed. Branch duct quantities shall be adjusted by volume or splitter dampers. Permanently mark set points of all dampers. Only minor air quantity adjustment by outlet dampers will be permitted.

G. Exhaust systems: Test and set all exhaust dampers, fans, or other device to exhaust the required amounts of air. Set exhaust systems to be tight closing when off. Note all amounts of airflow CFM.

H. Air System Data:

Fans:	Design RPM Final RPM	Design CFM Final CFM	Design Static Pressure Actual Static Pressure (suction - discharge)
Fan Motor:	Full Load Amps Operating Amps		
Air system:	Outside air minimum - maximum at economizer cycle. Cooling Coil: air temperature entering-leaving.		
Exhaust Hoods:			
	Mark drawings with actual CFM at each outlet, inlet to indicate final adjustment air quantity.		

PART 3 - REPORT

3.01 GENERAL:

A. The balancing concern shall record and submit for evaluation and review three copies of a complete Balancing Report.

B. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by, the referenced standards.

C. Prepare a report of recommendations for correcting unsatisfactory mechanical performance when system cannot be successfully balanced or performance tested.

3.02 REPORT FORMAT:

A. Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced.

B. In addition to the Report Forms, the Testing Adjusting and balancing results shall also be noted on reproducible drawings of the building provided by the Architect for that purpose. All data as specified herein shall be neatly and accurately indicated.

3.03 REPORT CONTENTS:

A. Identification of testing, adjusting, and balancing agency, Owner, and Project. Include addresses, contact names, and telephone numbers.

B. The seal and name, address, telephone number, and signature of the Test and Balance Engineer.

C. A listing of the instruments used for the procedures, and proof that all instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

D. The appropriate forms containing, as a minimum, the information indicated on the standard report forms prepared by the Associated Air Balance Council (AABC) and the National Environmental Balancing Bureau (NEBB) for each respective item and system. Prepare an accompanying schematic diagram that includes each item of equipment in the system being tested.

END OF SECTION 23 95 00

SECTION 26 00 00

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SECTION 26 00 00

ELECTRICAL

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS AND REFERENCES

A. Include “General Requirements” and applicable parts of Division 1 as part of this section.

B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. The Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.

E. The Electrical Subcontractor shall carry in the Bid Price all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Electrical Subcontractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total back charge costs to be incurred by the Local Utility Companies or Municipal Agencies.

1.02 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided Under Other Sections”.

B. As used in the Contract Drawings and Specifications for Electrical work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Electrical work.

1. “Furnish” means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Electrical work.

3. “Provide” means: “Furnish” and “Install”.

4. “New” means: Manufactured within the past two (2) years and never before used.

C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the Contract Drawings or Specifications for Electrical work carries with it the instruction to furnish, install and connect the item as part of the Electrical work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Electrical work are complimentary and are to be taken together for a complete interpretation of the Electrical work except that indications on the Contract Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

1.03 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.

1. Secondary electric service including underground conduit bank and secondary service entrance feeders, from the utility company pad mounted transformer, building grounding electrode and main service disconnect.

2. Interior secondary distribution systems including magnetic starters, overcurrent and switching devices, panelboards, raceways, cables, wiring, junction and pull boxes, wireways, and all other components required for complete electrical distribution system.

3. All lighting systems (indoor and outdoor, normal, night, emergency and exit) including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required for a complete lighting system.

4. Grounding and bonding of all electrical systems and equipment.

5. Fire alarm system complete with all devices and wiring. Match existing system.

6. Wiring devices (switches and receptacles) complete with associated wallplates.

7. Power wiring to HVAC, plumbing and fire protection equipment.

8. Testing of all electrical systems.

9. Access panels (furnish only).

10. Coordination between electrical and other trades.

11. Connections for all kitchen equipment.

12. Lighting control.

13. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.

14. All required staging and scaffolding of any height.

B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from Authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by an experienced observer. Site visit is particularly important because this is renovation work.

E. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by Owner. Report conditions that might affect work adversely in writing through Contractor to Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing and preparatory work.

1.04 RELATED WORK UNDER OTHER SECTIONS

A. The following items are not included in this section and will be performed under the designated sections.

1. Temporary Facilities.

2. Earthwork: Excavation and backfill.

3. Concrete:

   a. Concrete encasement for conduit banks.
   b. Rebar for items “a, b, c & d” above.

4. Masonry: All openings in masonry walls.

5. Waterproofing, Dampproofing and Caulking.

6. Roofing and Flashing.

7. Painting: All painting except as specified herein.

8. Finish Carpentry and Millwork.

9. Steel Doors and Frames.

10. Finish Hardware.

11. Plumbing.

12. HVAC.

13. Kitchen equipment.

1.05 REGULATORY REQUIREMENTS

A. Comply with all applicable Federal and State laws, and all Local Codes, By-laws and Ordinances.

B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.

C. Request inspections from Authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.

D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, Specifications, requirements and regulations:

1. State Building Code.

2. State Electrical Code.

3. National Fire Protection Association (NFPA).

4. Local Town Regulations and By-Laws.

5. Underwriter's Laboratories, Inc. (UL).

6. National Electrical Manufacturer's Association (NEMA).

7. American National Standards Institute (ANSI).

E. All Electrical work shall meet or exceed any other state and local codes and/or Authorities having jurisdiction including all other standards indicated herein.

1.06 SUBMITTALS

A. This paragraph shall supplement Division 1.

B. Definitions:

1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.

2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.

C. Submittals, Procedures and Format:

1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.

2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:

   a. Title.
   b. Name and location of project.
   c. Names of Architect, Engineer, Contractor and Subcontractor(s).
   d. Names of Manufacturer, Supplier, Vendor, etc.
   e. Date of submittal.
   f. Whether original submittal or resubmitted.

3. Shop Drawings and/or Manufacturer's Product Data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.

D. Acceptable Manufacturers:

1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Contract Drawings. In Division 26 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:

   a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
   b. Have identical operating characteristics to those called for in the Specifications.
   c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
   d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
   e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.

E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".

F. Substitutions and Deviations:

1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the “Acceptable Manufacturers” referred to above shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.

3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system. Any extra costs incurred to the project based on the use of alternate manufacturers shall be borne by the Contractor who has requested the substitution.

4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.

6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.

7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor’s expense, to confirm the manufacturer’s performance claims.

G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

☐ NO EXCEPTION TAKEN	☐ ACCEPTED AS NOTED
☐ NOT ACCEPTED	☐ REVISE AND RESUBMIT

1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is

subject to the requirements of the Contract Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

H. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:

1. Motor control wiring diagram submittals.

2. Short circuit and coordination studies.

3. Coordination Drawings, if required by this Specification.

4. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.

I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.

J. Responsibility:

1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.

2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.

K. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:

1. Light fixtures.

2. Panelboards.

3. Overcurrent and switching devices.

4. Wiring devices and wall plates.

5. Fire alarm system with wiring diagram and schedule.

6. Wiring and cables.

7. Conduit.

8. Boxes and fittings.

9. Safety switches.

10. Lighting control system.

1.07 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

1.08 COORDINATION

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.

D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Electrical work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any Electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owners.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Electrical work, and repair all damages without extra cost to the Owners.

1.09 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.

C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.

D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, and any switch wiring shall be the responsibility of the HVAC Subcontractor.

E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Subcontractor.

F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.10 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

A. Coordination Drawings:

1. The Sheetmetal Subcontractor shall prepare a complete set of electronic type background Drawings at a scale not less than 1/8” equals 1’-0”, showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.

2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.

3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

   a. Specialty Trades:
      1) Plumbing System.
      2) HVAC Piping and Associated Control System.
      3) Electrical.
      4) Sheet Metal Work.
      5) Sprinkler System.

4. Each specialty trade shall sign and date each Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.

5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The

Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.

6. A Subcontractor who fails to promptly review and incorporate his work on the Contract Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.

7. The Sheetmetal Subcontractor shall make copies of all coordination Drawings. Fabrication shall not start until such copies of completed Drawings are received by the Architect/Engineer and have been reviewed.

8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

1.11 INSTALLATION REQUIREMENTS

A. The arrangement of all Electrical work shown on the Contract Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.

B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

1.12 TYPICAL DETAILS

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

1.13 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Mechanical and Electrical work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

1.14 CORING, DRILLING

A. Core, cut and/or drill all small holes 4.5” diameter or less in walls, floors and ceiling required for the installation of sleeves, supports, and conduit for the Electrical work.

1.15 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING

A. All penetrations made through fire rated assemblies (structures or partitions) shall be completely and properly fire sealed with the appropriate firestop systems installed in accordance with the Manufacturer’s recommendations. The firestop material UL listed fire rating shall match or exceed the fire rated assemblies. Verify with Architect if project is utilizing a specified product. If not, provide product manufactured by Hilti, Nelson or STI.

B. Provide waterproofing of all materials which penetrate a floor, exterior wall, slab or roof. All sleeves shall extend a minimum of 3 inches above floor or roof. All penetrations thru building foundation walls shall utilize Link-Seal products or approved equal.

1.16 ACCESSIBILITY

A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.

B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.17 SUPPLEMENTARY SUPPORTING STEEL

A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.

B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.

C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.

E. All manufactured steel parts and fittings shall be galvanized.

1.18 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the Mechanical and Electrical equipment at the site.

1.19 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

1.20 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of work prepare a complete set of Record Drawings utilizing AutoCAD produced drawings showing all systems as actually installed, including all fire alarm and electrical circuitry. Submit three (3) sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.

D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.

E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

1.21 GUARANTEE/WARRANTY

A. Guarantee and 24 Hour Service:

1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.

3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.

5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.

6. Submit copies of equipment and material warranties to Architect before final payment.

7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.

8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.

9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed

those of this paragraph. Those paragraphs shall govern.

10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.

11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

1.22 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

1. Table of Contents.

2. Introduction:

   a. Explanation of manual and its purpose and use.
   b. Description of the electrical systems.
   c. Safety precautions necessary for equipment.
   d. Illustrations, schematics and diagrams.
   e. Installation drawing.

3. Maintenance:

   a. Maintenance and lubricating instructions.
   b. Replacement charts.
   c. Trouble-shooting charts for equipment components.
   d. Testing instructions for each typical component.
   e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.

4. Manufacturer's Literature:

   a. The equipment for which Shop Drawings have been submitted and approved.

1.23 SERVICE CHARACTERISTICS

A. Secondary Building Voltage – Low Level: 120/208.

B. All equipment and wiring shall be suitable for the applied voltage.

1.24 QUALITY ASSURANCE

A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.

B. All work shall comply with the latest editions of the codes as referenced herein.

C. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.

D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.

E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

F. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.

2. Be without blemish or defect.

3. Not be used for temporary light and power purposes.

4. Be in accordance with the latest applicable NEMA standards.

5. Buy products which will meet with the acceptance of all Authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.

H. For items which are to be installed but not purchased as part of the Electrical work, the Electrical work shall include:

1. The coordination of their delivery.

2. Their unloading from delivery trucks driven into any point on the property line at grade level.

3. Their safe handling and field storage until the time of permanent placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.

5. Field erection and internal wiring as necessary for their proper operation.

6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.

I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no

claims have been submitted as outlined above.

1.25 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

1.26 TEMPORARY POWER AND LIGHTING

A. The Electrical Subcontractor shall furnish and install feeders of sufficient size from the Utility Company's power lines for the electric light and power requirements for the building while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.

B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.

C. The Electrical Subcontractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points so that extension cords of not over 50 feet in length will reach all work requiring temporary light or power.

D. The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and the Clerk of the Works as specified in the contract form.

E. All temporary Electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.

F. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.

G. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.

H. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.

I. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 1/2 hour before and 1/2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local Authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time,

materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

1.27 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

1.28 EXTRA MATERIALS

A. Furnish extra materials as indicated below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. 10% of each total lamps installed.

2. 10% of each total circuit breakers installed.

3. 10% of each total fuses installed.

4. Ten (10) toggle switches and duplex receptacles.

5. 10% of total audio/visual appliances installed.

6. 10% of each total pull stations and smoke detectors installed.

1.29 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

A. During the execution of the work, required relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required by job conditions and as determined by the Architect in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical period of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two (2) weeks in advance. Owner shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

B. Prior to any deactivation and relocation or demolition work, consult the Contract Drawings and arrange a conference with the Architect and Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.

C. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Subcontractor. Place all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) as determined by the Authority Having Jurisdiction in General Contractor's dumpster. All hazardous electrical materials shall be legally disposed of by the Electrical Subcontractor.

D. The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.

E. Phasing:

1. The Electrical Subcontractor shall construct the subject project in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural Drawings.

PART 2 – PRODUCTS

2.01 GENERAL

A. Product Specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: Non-metallic sheathed cable is not specified; therefore it is not acceptable.

B. For purpose of establishing a standard of quality and not for purposes of limiting completion, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project, and not part of a manufacturer's standard product line, will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.

D. Where Specifications list manufacturers names and/or "as approved" or "equal approved by Designer", other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by the Architect.

E. All materials shall be new and shall be UL listed.

2.02 RACEWAYS AND FITTINGS

A. Raceways – General:

1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided.

2. Aluminum conduit, conforming to, and installed in accordance with, Article 358 of NFPA 70 shall conform to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.

3. Flexible metal conduit (FMC) conforming to, and installed in accordance with Article 348 of NFPA 70 shall be used for connections to recessed light fixtures, vibrating equipment and motors. All FMC shall be secured and supported in accordance with Article 348 of NFPA 70.

4. Liquidtight flexible metal conduit (LFMC) conforming to, and installed in accordance with Article 350 of NFPA 70 shall be used for connections to light fixtures, vibrating equipment and motors. All LFMC shall be secured and supported in accordance with Article 350 of NFPA 70. If used on roof applications, all LFMC shall be supported by sleepers approved by the Architect prior to installation.

5. Rigid non-metallic conduit may be used at the Contractor's option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40 or 80, 90° C. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at Contractor's expense. Schedule 40/80 conduit shall be installed in conformance with Article 352 of NFPA 70. Use of type EB or A PVC conduit is not allowed.

6. PVC Schedule 40 shall be used for below grade slab circuits within building confines. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used in slabs. Rigid steel elbows or stubs shall be used for penetrations from below slab or through exterior walls into building. PVC shall be installed within building for power wiring and lighting wiring. Raceways and fittings shall be produced by same manufacturer. All PVC conduit shall comply with ANSI/UL 651.

7. Where indicated on the project drawings provide color coded Aluminum conduit as follows:
   a. Red – Fire and Emergency Systems.
8. Acceptable Manufacturers:
   a. Wheatland Tube Company
   b. Allied Tube
   c. Western Tube & Conduit
   d. Carlon
   e. Perma-Cote Supreme
   f. Cantex
9. Fittings:
   a. Provide insulated bushings on all raceways that house conductors #4 AWG or larger at all threaded fittings no matter what the size of the conductor.
   b. Manufacturer's standard fittings shall be used for raceway supports.
   c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
   d. Couplings for rigid metal conduit and IMC shall be threaded type. Provide insulated bushings.
   e. All fittings for aluminum conduit shall be aluminum. No die-cast fittings are allowed. Set screw and compression connectors are allowed.
   f. Threadless fittings for Aluminum conduit shall be watertight compression type. All fittings shall be concrete tight.
   g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK" or Link-Seal.
   h. Couplings, elbows and other fittings used with rigid nonmetallic raceways shall be of the solvent cemented type to secure a waterproof installation.
   i. Acceptable manufacturers:
      1) O.Z. Gedney
      2) Crouse Hinds
      3) American Fittings
      4) Hubbell
      5) Thomas & Bett

2.03 WIRING MATERIALS

A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.

B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.

C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.

D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors “white” or “gray”. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

E. Final connections to motors shall be made with 18” of neoprene sheathed flexible conduit.

F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.

G. Fire alarm and security system wiring shall be per manufacturer’s recommendations.

H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.

I. Metal clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C, and shall be thermoplastic material. Armor material shall be aluminum armor design (MC Lite)shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed and acceptable to the Local Authority Having Jurisdiction.

J. Wiring materials shall be manufactured by Southwire, Prysmian, General Cable, or equal.

2.04 OUTLET, JUNCTION, PULL BOXES AND WIRING TROUGHS FOR ALL SYSTEMS

A. Outlets:

1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of PVC type having hubs. Concealed boxes shall be PVC type. Old work boxes with Madison clamps are not allowed in new construction.

2. Outlet boxes for Fire Alarm devices shall be Aluminum.

3. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2” deep unless shallower boxes are required by structural conditions and are specifically approved by Architect.

Ceiling and bracket outlet boxes shall not be less than 4” octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4” square or of comparable volume.

4. Acceptable Manufacturers:

   a. Appleton
   b. Crouse Hinds
   c. Steel City
   d. RACO

B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish and install appropriately designed boxes. Boxes shall be PVC with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

2.05 WIRING DEVICES

A. Provide wiring device type plates for all wall-mounted devices. All wall plates shall be smooth high impact nylon for all areas, color as directed by the Architect. Provide galvanized steel for all Utility, Electric and Mechanical Rooms.

B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:

   1. Visible part colors of wiring devices shall be as directed by the Architect for all areas. Provide brown devices for all Utility, Electrical and Mechanical rooms.

   2. Exclude compact or “despard” type devices.

C. Wiring device switches shall be toggle type, A.C. quiet design, specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48” to center line above finished floor unless noted otherwise.

   1. Single pole switch shall be equal to Hubbell No. 1221.

   2. Double pole switch shall be equal to Hubbell No. 1222.

   3. Three-way switch shall be equal to Hubbell No. 1223.

   4. Four-way switch shall be equal to Hubbell No. 1224.

   5. Single pole pilot light switch shall be equal to Hubbell No. HBL 1221PL.

6. Equivalent 277 volt 20 amp switches shall be used where required.

D. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), “U-bar” ground NEMA slot configuration 5-20R specification grade. Receptacles shall be mounted 18” to center line above finished floor unless noted otherwise.

1. Equal to Hubbell No. 5362.

2. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V to be equal to Hubbell No. GF5362. All GFI receptacles shall be self-testing type in compliance with UL 943.

E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.

F. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Architect.

G. For unfinished spaces, plates for surface-mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.

H. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gang under a common wall plate.

I. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.

J. Wiring devices and associated hardware shall be manufactured by Leviton, Hubbell or Pass and Seymour.

2.06 GROUNDING REQUIREMENTS

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70, Article 250 and the following:

1. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.

2. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

3. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.

4. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this be equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed.

This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

5. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.

6. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

2.07 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below:

120/208 V Circuits	277/480V	Phase Circuits
Black	Brown	A
Red	Orange	B
Blue	Yellow	C
White	Grey	Neutral
Green	Green with Yellow Tracer	Equipment Ground

B. Color coding shall be achieved by one of the following methods:

1. The insulation or covering shall be coded during manufacture by use of one of the following methods:

   a. Colored compounds.
   b. Colored coatings.

2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.

C. The same colored cable shall be connected to the same phase throughout the project.

D. In general, building load centers and panelboards shall be phased “A”, “B”, “C”, left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

2.08 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES

A. Construction shall be NEMA Class I, where installed indoors.

B. Construction shall be NEMA Class IIIR, where installed outdoors, in mechanical rooms, in locations defined as damp or wet by NFPA 70 or where indicated as weatherproof.

C. Operating handles shall be front or side type to accommodate hand access space and flush or surface mounting requirements.

D. Each shall be equipped with padlock for locking operating handle in the open position.

2.09 PANELBOARDS

A. Panelboards shall consist of factory completed dead front assemblies of back pans, main busses,

overcurrent and switching units, sheet metal cabinets and trims. They shall be so designed that switching and overcurrent devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machine drilling or tapping.

B. Where indicated as power or distribution panels, they shall be as manufactured by Square D, Siemens, Eaton, or General Electric.

C. Bus bars for their mains shall be of copper having current capacities as indicated and sized for such capacities in accordance with Underwriter Laboratory standards. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction.

D. A ground bus shall be provided for each panel. Each ground bus shall be of the same material as the phase and neutral buses.

E. Cabinets shall be fabricated from industry standard gauge galvanized sheet steel with corners lapped and riveted, or fastened by approved methods.

F. The inside and outside of the trims shall be factory painted with one (1) rust proofing primer coat and one (1) finish coat. The finish paint shall be of a type to which field applied paint will bond. All trims shall be hinged.

G. Cabinets and trims shall be suitable for the required mounting. Trims shall be fastened to cabinets and shall be of a type that is self-supporting on cabinets. Trims for flush panels shall overlap cabinets by at least 3/4" all around. Where two section panels are required, cabinets shall be of equal height including those cases where there is one main for both sections.

H. Cabinets and trims for lighting and appliance panels shall accommodate and conform to the following limited dimensions:

1. Minimum wiring gutter width on each side: 5-3/4”.

2. Maximum overall width: 24”.

3. Maximum overall depth: 6”.

I. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.

J. Any cabinet for a power or distribution panel shall (regardless of the actual devices required to be in it) have a width, depth and bussing adequate for a 3-pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42” or deeper than 18”.

K. Hinged doors covering all switching device handles shall be included in all panel trims.

L. Doors in panelboard trims shall conform to the following:

1. In making switching device handles accessible, doors shall not uncover any live parts.

2. Doors shall have flush type paracentric cylinder locks and catches. Two (2) keys shall be supplied for each lock and each key shall open all panelboards. Locks and keys shall conform to a “standard keying policy” as directed.

M. Where “spaces only” for overcurrent protection and switching devices are called for in a panel, its main bus, and backpan, as well as its cabinet and trim, shall be extended to accommodate these spaces and shall include all necessary hardware including bus connectors to add future devices.

N. Panelboards shall comply with the following industry standards:

1. UL Standards:

   a. Panelboards – UL67.
   b. Cabinet & Boxes – UL50.

2. NEMA Standard – PB1.

O. Panelboards shall be labeled with UL short-circuit rating adequate for the available short-circuit and based on the lowest panel mounted circuit breaker available UL listed interrupting current rating, but in no case less than 65 ka for 480 volt and 22 ka for 240 volt panelboards.

P. Provide “lock on” clips for the toggle handles of certain branches serving the Fire Alarm System, security, etc.

Q. Panelboards shall be manufactured by Eaton, Siemens, Square D, or General Electric.

2.10 MOLDED CASE CIRCUIT BREAKERS

A. Molded case type circuit breakers shall consist of manually operated quick-make quick-break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the “thermal magnetic” type having bimetallic elements for time delay overload protection and magnetic elements for short-circuit protection.

2. They shall be manually operable by means of toggle type operating handles having “tripped” position midway between the “on-off” positions.

3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.

4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short-circuit of the values indicated in the “Power System Studies” in this section by a factor of 1.2 with a minimum as follows:

   a. 240V class panels/breakers: 10 kAIC where shown fed by a 150 kVA or less transformer
      1) 10 kAIC where shown
      2) 22 kAIC where shown fed by a 300 kVA or less transformer.
   b. 480V Class Panels/Breakers shall be 65 kAIC.

5. They shall be of the “bolted-in” type.

   a. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.
   b. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.
   c. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.
   d. All circuit breakers connected to lighting branch circuits shall be high magnetic type breakers.

6. They shall be manufactured by Square D, Siemens, Eaton, or General Electric.

2.11 CARTRIDGE FUSES

A. Cartridge fuses shall be as follows:

1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.

2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.

3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 340,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.

4. Circuits 0-600 amperes shall be protected by the equal of Bussman “Low Peak” current limiting fuses, LPN-RK (250 volts), LPS-RK (600 volts), UL class RK-1.

5. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.

6. Supply 10% spare fuses of each size and type 60 amps and less. Supply three (3) spare fuses for each size and type over 60 amps.

B. Cartridge fuses shall be manufactured by Bussman, Gould or EFCO.

2.12 MOTOR CONTROLS

A. Motor Controls – Manual and Magnetic:

1. Individually-mounted magnetic starters shall be across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated. Check exact type of two-speed or part-winding motors to be furnished by other contractors, and provide proper starter.

2. Starters shall be of the replaceable contact double break type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1.

   a. Starters shall have OL reset button, green pilot light to indicate “ON”, and “HAND-OFF-AUTO” switch in cover. Pilot lights shall be push-to-test type.
   b. Starters to have 120 volt control transformers with fused output being provided for those units operating on 277/480 volt system.
   c. Provide proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of three (3) thermal overloads for each starter.
   d. Provide four (4) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
   e. Motor starters installed in dry locations shall have NEMA I enclosures. Those in wet locations shall have NEMA IV enclosures.
   f. Acceptable Manufacturers:
      1) Siemens
      2) Eaton
      3) Square D
      4) General Electric

3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on

each phase.

B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of “factory assembled” control panel will be provided under section supplying equipment to be controlled but connected under this section.

C. Disconnect Switches:

1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy-duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in “OFF” position. Three (3) pole toggle switches are not acceptable as substitute for disconnect switches.

2. Disconnect switches shall be of fused or un-fused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.

3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.

4. Acceptable Manufacturers:

a. Eaton
b. Siemens
c. Square D
d. General Electric

D. Combination Starter: Provide combination starters where indicated on the plans.

E. Motor Control Circuitry:

1. Except as noted below, select materials exactly as specified for feeders. Utilize No. 12 A.W.G. THWN conductors throughout minimum.

2. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices; also from pull boxes and junction boxes containing the wires of main and sub main feeders. Utilize auxiliary pull boxes to separate motor control wires from motor power circuit wires before the power circuit wires enter the items from which motor control wires are excluded.

3. Prior to installing any motor control circuitry for a particular motor, notify the Architect of any deviations between the control circuitry requirements of the trade supplying the motor and the indicated electric work.

2.13 LIGHTING FIXTURES

A. All lighting fixtures shall be in accordance with identifications on the Contract Drawings and the following:

1. Finishes shall be as selected by the Architect or as indicated on the plans.

2. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the Contract Drawings, shall be included.

3. Exact location of all fixtures shall be confirmed with Architect prior to rough-in.

4. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.

5. All fixtures shall be UL approved with labels attesting thereto.

6. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the General Contractor.

7. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field.

8. All lamp sockets in lighting fixtures shall be suitable for the indicated lamps and shall be set so that the lamps are positioned in optically correct relation to all lighting fixture components.

9. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains, threaded rods or #14 gauge tie wire.

10. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations.

11. Lamps shall be manufactured by Eaton, Phillips. OSRAM, or Sylvania.

B. LED Lamps and Luminaires:

1. Solid State Lighting/Light Emitting Diode (LED) Lamps and Luminaries:

   a. Luminaire manufacturer shall have a minimum of five (5) years' experience in the manufacture and design of LED products and systems and no less than one hundred (100) North American installations.
   b. Unless otherwise specified, all LED luminaires and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
   c. All components, peripheral devices and control software are to be provided by and shall be the responsibility of a single entity. All components shall perform successfully as a complete system.
   d. Include all components necessary for a complete installation. Provide all power supplies, synchronizers, data cables, and data terminators for a complete working system.
   e. All LED sources used in the LED luminaire shall be of proven quality from established and reputable LED manufacturers and shall have been fabricated after 2007.

2. Replacement and Spares:

   a. Manufacturer will keep record of original bin for each LED module and have replacement modules from the same bin available for three (3) years after date of installation.
   b. Manufacturer will keep an inventory of replacement parts (source assembly, power and control components).
   c. Manufacturer's LED system will not become obsolete for ten (10) years.
   d. Manufacturer will provide exact replacement parts, or provide upgraded parts that are designed to fit into the original luminaire and provide equivalent distribution and lumen output to the original, without any negative consequences.
   e. Manufacturer has in place a written recycling and re-use program, and will accept returned product and/or components for recycling or re-use.
   f. Manufacturer will properly dispose of non-recyclable components that are deemed

harmful to the environment.

g. System shall carry a full warranty for five (5) years. Manufacturer shall be responsible for cost of labor not to exceed $50 per individual part, and cost of shipping, to replace any component of the system that fails within two (2) years of installation.

3. Products and Components – Performance:

a. LED luminaires and components shall be UL listed or UL classified.
b. LED luminaires and components shall be CE certified.
c. LED luminaires and components shall be PSE marked.
d. All LED luminaires shall be subjected to the following JEDEC Reliability Tests for Lead-free Semiconductors: HTOL, RTOL, LTOL, PTMCL, TMSK, Mechanical Shock, Variable Vibration Frequency, SHR, Autoclave.
e. To ensure luminaire quality, luminaire shall have been tested under accelerated life test conditions including an operating temperature span of 360 degrees F, and cyclic loading up to 60G.
f. All products included in system shall use Mil-Std 810F, Random Vibration 7.698g as a minimum standard. In installations subject to vibration, luminaire shall be installed with vibration isolation hardware to sufficiently dampen vibrations.
g. All LED components shall be mercury and lead-free.
h. All manufacturing processes and materials shall conform to the requirements of the European Union's Restriction on the Use of Hazardous Substances in Electrical and Electronics Equipment (RoHS) Directive, 2002/95/EC.

i. LEDs shall comply with ANSI/NEMA/ANSLG C78.377-2008 – Specifications for the Chromaticity of Solid State Lighting Products. Color shall remain stable throughout the life of the lamp. Color shall match approved sample.
j. LEDs shall comply with IESNA LM-80 – Standards for Lumen Maintenance of LED Lighting Products.
k. White LEDs shall have a rated source life of 50,000 hours under normal operation conditions. RGB LEDs shall have a rated source life of 100,000 hours. LED "rated source life" is defined as the time when a minimum of 70% of initial lumen output remains.
l. Luminaire assembly shall include a method of dissipating heating so as to not degrade life of source, electronic equipment, or lenses. LED luminaire housing shall be designed to transfer head from the LED board to the outside environment. Luminaire housing shall have no negative impact on life of components.
m. Manufacturer shall supply in writing a range of permissible operating temperatures in which system will perform optimally.
n. High power LED luminaires shall be thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware.
o. LEDs shall be adequately protected from moisture or dust in interior applications.
p. For wet and damp use, LED-based luminaires itself shall be sealed, rated, and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure. Such protection shall have no negative impact on rated life of source or components, or if so, such reductions shall be explicitly brought to the attention of the Designer.
q. All hardwired connections to LED luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
r. The LED luminaire shall be operated at constant and carefully regulated current levels. LEDs shall not be overdriven beyond their specified nominal voltage and current.
s. RGB LED luminaries shall utilize an equal combination of high brightness red, blue and green LEDs, unless otherwise noted, to provide up to 16.78 million additive RGB colors and shall be capable of at least 8-bit control.

t. Manufacturer shall be able to provide supporting documentation of the product meeting third party regulatory compliance.
u. Manufacturer shall ensure that products undergo and successfully meet appropriate design and manufacturability testing including Design FMEA, Process FMEA, Environmental Engineering Considerations and Laboratory Tests, IEC standards and UL/CE testing.
v. All LED luminaires (100% of each lot) shall undergo a minimum twenty-four (24) hour burn-in during manufacturing, prior to shipping.
w. Manufacturer shall provide Luminaire Efficacy (lm/W), total luminous flux (lumens), luminous intensity (candelas) chromaticity coordinates, CCT and CRI optical performance, polar diagrams, and relevant luminance and illuminance photometric data. Provide data in IES file format in accordance with IES LM-79-2008, based on test results from an independent Nationally Recognized Testing Laboratory.
x. Power/Data supply shall have the following:
   1) Supply outputs shall have current limiting protection.
   2) Supply shall provide miswiring protection.
   3) Supply shall have power factor correction.
   4) Supply shall provide connections that are conduit-ready or clamp-style connections in the case of low-voltage wiring.
   5) Supply shall come with a housing that meets a minimum IP20 rating for dry location installation unless located in a damp or wet location.
   6) Supply shall be UL listed for Class 1 or Class 2 wiring.

2.14 TELEPHONE/DATA EMPTY RACEWAYS AND OUTLETS SYSTEM

A. The Electrical Contractor shall furnish and install, complete in every respect, a telephone empty raceway system, all interior raceways, pull boxes, plywood backboards, outlets, outlet cover plate, fittings, and all other appurtenances required, leaving the entire installation ready for installation of telephones, equipment and cables.

B. In general, the telephone system raceways, outlets and terminal backboard locations shall be as shown on the Contract Drawings.

C. All work and the entire installation of same shall be coordinated with the Architectural/ Engineering Coordination Office of the Telephone Company and the Electrical Contractor before the start of the construction and shall be in full conformance with their requirements and recommendations.

D. The Electrical Contractor shall furnish a nylon pull cord in each raceway to facilitate the pulling of cables in the future.

E. All outlet cover plates shall be furnished by the Electrical Contractor. All telephone outlet cover plates shall be blank cover plates of the same finish and by the manufacturer furnishing all other devices and switch plates installed throughout the buildings.

F. Telephone terminal locations shall be provided as designed on the Contract Drawings. The Electrical Contractor shall furnish and install 3/4 inch thick sheet of plywood backboard for the mounting of equipment and cable terminators by the Telephone Company. The backboards shall be painted with two (2) coats of fire-retardant paint by the Electrical Contractor. Exact dimensions of the backboards shall be as indicated on the Contract Drawings and as required by the Telephone Company.

G. Conduit from telephone outlets indicated on the Contract Drawings shall be installed into the nearest partition, extend a minimum of 6 inches into nearest accessible ceiling space and left

ready to be used by the Telephone Company for the installation of their cables.

2.15 ACCESS PANELS

A. Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.

B. Access panels shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that junction can be easily reached and size shall be sufficient for purpose (minimum size 12” x 16”). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed.

C. Access panels shall be prime-painted and equipped with screwdriver operated cam locks.

D. Acceptable Manufacturers:

1. Inland Steel Products Company – Milcor

2. Miami Carey

3. Walsh-Hannon-Gladwin, Inc. – Way Locator

4. Specific Types:

a. Acoustical Tile Ceiling “Milcor Type AT”
b. Plastered Surfaces “Milcor Type K”
c. Masonry Construction “Milcor Type M”
d. Drywall Construction “Milcor Type DW”

E. Furnish access panel Shop Drawings.

2.16 UNDERGROUND ENCLOSURES

A. Underground enclosures and covers are for use in residential sidewalks and/or driveways subject to occasional non-deliberate heavy traffic. The enclosures shall be suitable for direct buried applications in soil, concrete embedment, or asphalt embedment.

B. The enclosures shall be concrete/cement gray in color, unless otherwise specified.

C. Box Dimensions and Description:

1. The box shall be -- inches in width, -- inches in length, and approximately -- inches in height.

2. The box shall have an open bottom.

D. Cover:

1. The cover shall have a logo that reads “_____”.

2. The cover shall have two lifting eyes/pull slots with the following dimensions – 1/2” x 4” with a 1/4” center pin.

3. The cover’s surface shall be skid resistant and have a minimum coefficient of friction of 0.50,

as specified in current ANSI/SCTE 77.

4. The cover shall have two locking bolt slots, and two 3/8” – 16 UNC hex head bolts to secure the cover into the box.

E. Knockouts shall be notched to allow for a smooth edge upon removal.

F. The enclosures (Box and Cover) shall comply with all of the environmental tests as per current ANSI/SCTE 77.

G. Structural Requirements:

1. The enclosures (Box and Cover) shall be current ANSI/SCTE 77 Tier 22 and shall be UL Listed to 66WF and tested to the full ANSI standard.

2. The enclosures (Box and Cover) shall comply with all structural load tests as per current ANSI/SCTE 77 and shall be UL Listed to full ANSI standard - 66WF.

H. Approved Manufacturers:

1. Quazite

2. CDR

3. Hubbell Enclosures

4. Strongwell

5. PenCell Plastics, Inc.

I. Provide box collar around each underground enclosure. Box collars shall be tested to withstand a Tier 22 test load. Each collar shall meet or exceed the following requirements:

1. ANSI/SCTE77 Section 6.0

2. ASTM D2444

3. ASTM 1028-06 Section 8.

PART 3 EXECUTION

3.01 BASIC REQUIREMENTS

A. Adhere to best industry practice and the following:

1. All work shall be concealed.

2. Route circuitry runs embedded in concrete to coordinate with structural requirements.

3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16” in diameter and clearly identify both ends of the raceway.

4. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the Contract Drawings due to symbolic methods of notation.

5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.

6. Beyond the termination of raceways, fireproof the following:

   a. All wires and cables within pad-mounted transformer enclosure.
   b. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
   c. Fireproofing of wires and cables shall be by means of a half-lapped layer of arc proof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.

7. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.

   a. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
   b. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
   c. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's etc.

8. No splicing of wires will be permitted in Fire Alarm System.

9. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner.

10. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

11. In electric rooms with equipment rated 800 amps or more and over 6 feet wide that contains overcurrent devices, the Electrical Contractor shall provide a powered Exit sign at 18" AFF at each door.

12. All building mounted photovoltaic equipment shall be installed, tested and maintained in accordance with NFPA 1 Section 11.12.

13. All panelboards shall be labeled in accordance with NFPA 70 Article 408.

3.02 TESTING REQUIREMENTS & INSTRUCTIONS

A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout Division 26 work.

B. The Electrical Subcontractor shall pay for all tests specified in Division 26, including expenses incident to retests occasioned by defects and failures of equipment to meet Specifications, at no additional cost to the Owner. Any defects or deficiencies discovered in any of the Electrical work shall be corrected.

1. The Electrical Subcontractor shall:
   a. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the Owner.
   b. Submit three (3) copies of test results to the Engineer.
2. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the Manufacturer's installation instructions. Where deviations are apparent, obtain the Manufacturer's approved review of procedures prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.
3. Tests are to:
   a. Provide initial equipment/system acceptance.
   b. Provide recorded data for future routine maintenance and trouble-shooting.
   c. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
      1) At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the Engineer. Corrective action by the Contractor requires prior Engineer approval, retesting, and inspection.
      2) Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in Section 3.7. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect Manufacturer's Drawings and instructions for delivery to the Engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.
      3) Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five (5) years of experience with tests of same type and size as specified.
      4) Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.
         a) National Electrical Manufacturer's Association – NEMA.
         b) American Society for Testing and Materials _ ASTM.
         c) Institute of Electrical and Electronic Engineers – IEEE.
         d) National Electrical Testing Association – NETA.
         e) American National Standards Institute – ANSI.
         f) C2: National Electrical Safety Code.
         g) Z244-1: American National Standard for Personnel Protection.
         h) Insulated Cable Engineers Association – ICEA.
         i) Association of Edison Illuminating Companies – AEIC.
         j) Occupational Safety and Health Administration – OSHA.
         k) OSHA Part 1910; Subpart S, 1910.308.
         l) OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
         m) National Fire Protection Association – NFPA.
         n) 70B: Electrical Equipment Maintenance.
         o) 70E: Electrical Safety Requirements for Employer Workplaces.
         p) 70: National Electrical Code.
         q) 78: Lightning Protection Code.
         r) 101: Life Safety Code.
         s) Inspections and tests shall utilize the following references:
         t) Contract Drawings and Specifications.
         u) Contractor's Short Circuit and Construction Study, in accordance with

Section 26 00 00D.

v) Manufacturer's printed test procedures for respective equipment.

4. Test Equipment:

   a. Test equipment used by the Contractor is to be inspected and calibrated.
   b. Perform calibration and setting checks with calibrated test instruments of at least twice that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over six (6) months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.

5. Test Procedures:

   a. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
   b. Submit proposed testing and checkout forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.
   c. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, Manufacturer's instructions, Drawings, and Specifications. Tests are in addition to shop tests of individual items at the Manufacturer's plant. Perform insulation and ground resistance tests before operating tests.
   d. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following items and conditions:
   e. Prior to energization and/or placing into service.
   f. When damage to the insulation is suspected or known to exist.
   g. After repairs or modifications to the equipment affecting the insulation.
   h. Where lightning or other surge conditions are known to have existed on the circuit.
   i. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.
   j. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.
   k. Report inspections, tests, and calibrations in writing on Engineer approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses and the Engineer. The forms shall serve as the test and inspection checklist.
   l. When the electrical tests and inspections specified or required within Division 26 are completed and results reported, reviewed, and approved by the Engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the Engineer of electrical completion. If the Engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable

to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.

C. Specific Tests: Perform the following specified tests. De-energize and isolate equipment and cable prior to performing the tests.

D. Motors:

1. Before energizing any machine, visually inspect for serviceability. Check Manufacturer's instruction manual for correct lubrication and ventilation. Align motor with driven equipment. Check nameplate for electrical power requirements.

2. Test run motors uncoupled or unloaded, before placing into operation. Check the motor for rotation, speed, current and temperature rise under normal load and record the results. Maintain the proper color codes for phase identifications. This may require swaps at the motor for proper rotation. Use motor phase rotation meter prior to lead connection at motor in order to minimize later swaps.

E. Grounding Systems:

1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.

2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.

3. Test each ground rod and measure ground resistance. If resistance is not 25 ohms or less, drive additional rods to obtain a resistance of 25 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.

4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.

5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.

6. Wire and Cable: (All conductors originating from main switchboard and distribution panels).

   a. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field-applied tag per conductor. Continuity test each wire and cable to verify the field-applied tag per conductor. Minimum insulation resistance valves shall not be less than two (2) megohms.
   b. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.
   c. Check cables and wires for the proper identification numbering and/or color coding.

d. Inspect cables for physical damage and proper connection in accordance with single line diagram.

F. Power Distribution System:

1. Circuit Breakers – Molded Case:

a. Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.
b. Operate circuit breaker to ensure smooth operation.
c. Inspect case for cracks or other defects.
d. Check tightness of connections with calibrated torque wrench. Refer to manufacturer's instruction for proper torque levels.
e. Perform a contract resistance test or measure millivolt drop at rated current.
f. Perform an insulation resistance test at 1000 volts DC for one (1) minute from pole-to-pole and from each pole-to-ground with breaker closed and across open contract in each phase – 500V DC if circuit breaker is solid state.
g. Adjustable trip breakers shall have minimum pickup current determined by primary current injection where applicable.
h. Perform long time delay time-current characteristic tests by passing 300% rated current through each pole separately. Determine trip time.
i. Determine short time pickup and delay by primary current injection if applicable to the particular breaker.
j. Determine ground fault pickup and time delay by primary current injection if applicable to the particular breaker.
k. Determine instantaneous pickup currently by primary injection using run-up or pulse method. Clearing times shall be within four (4) cycles.
l. Verify trip unit reset characteristics.
m. Perform adjustments for final settings in accordance with breaker setting sheet if applicable to the particular breaker.
n. Compare contract resistance or millivolt drop valves to adjacent poles and similar breakers. Investigate deviations of more than 50%. Investigate any value exceeding Manufacturer's recommendations.
o. Insulation resistance shall not be less than 100 megohms.
p. Trip characteristics of adjustable trip breakers shall fall within Manufacturer's published time-current characteristic tolerance band.
q. All circuit breakers mounted in switchboards and distribution boards shall be time-current tested by primary current injection where possible, and also any remotely mounted breakers of frame size 400 ampere and larger.
r. Adjust settings and calibrate all circuit breakers as recommended in the short circuit analysis and coordination study.

2. Motor Control:

a. Inspect for physical damage, proper anchorage and grounding.
b. Compare equipment nameplate data with design plans or starter schedule.

3. Motor Running Protection:

a. Compare overload heater rating with motor full-load current rating to verify proper sizing
b. If motor running protection is provided by fuses, verify proper rating considering motor characteristics.
c. Check tightness of bolted connections.
d. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute.
e. Measure insulation resistance of each starter section phase-to-phase and phase-to-ground with the starter contacts closed and the protective device open.

f. Measure insulation resistance of each control circuit with respect to ground.
g. Test motor overload units by injecting primary current through overload unit and monitoring trip time at 300% of motor full-load current.
h. Perform operational tests by initiating control devices to affect proper operation.
i. Bolt torque levels shall be in accordance with Manufacturer's recommendations.
j. Perform insulation resistance test, 1000 VDC minimum test voltage and 100 megohms minimum insulation resistance.
k. Control wiring insulation test voltage shall be 1000 VDC. Manufacturer shall be consulted for test voltage where solid-state control devices are utilized.
l. Perform overload tests at 300% of motor full-load current. Trip times shall be in accordance with Manufacturer's tolerances. Investigate values in excess of 120 seconds.

4. Panelboards:

   a. Inspect for physical damage and proper grounding.
   b. Compare nameplate information with schedules and report any discrepancies.
   c. Inspect all panelboards for cleanliness, workmanship, etc.

5. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a Manufacturer's Representative at site for instructional purposes shall also be included.

3.03 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.

B. Circuits shall be balanced on phases at their supply as evenly as possible.

C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.

E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one (1) cable for each leg and one (1) neutral cable, if any.

F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:

   1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.

   2. Minimum conductor size shall be No. 12 AWG copper.

   3. Conductors operating at 120 volts extending in excess of 100 ft. or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 AWG copper throughout.

   4. Lighting fixtures and receptacles shall not be connected to the same circuit.

5. Circuits shall be balanced on phases at their supply point as evenly as possible.

G. Type MC Cable Installation:

1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:

   a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of type specifically designed for use with cable, i.e., romex connectors not acceptable.
   b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co.; not with a hacksaw.
   c. Use split “Insuliner” sleeves at terminations.

3.04 SHORT-CIRCUIT COORDINATION STUDIES

A. Scope of Services:

1. Provide a current and complete short-circuit study, equipment-interrupting or withstand evaluation, and a protective-device coordination study for the electrical distribution system.

   a. The study shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operation, and operations which could result in maximum-fault conditions shall be thoroughly covered in the study.

2. Short-Circuit Study:

   a. The study shall be in accordance with applicable ANSI and IEEE standards.
   b. The study input data shall include the utility company’s short-circuit single- and three-phase contribution, with X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.
   c. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.

3. Equipment Evaluation Study: An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Evaluation study should be submitted prior to final approval of equipment submittals.

4. Protective-Device Coordination Study:

   a. A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings.
   b. The coordination study shall include all voltage classes of equipment from the utility’s incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.
   c. Coordination shall be in accordance with requirements of the National Electrical Code

and the recommendations of the IEEE Standard 399.

d. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Owner's attention.

e. The overcurrent relays in the existing incoming switchgear shall be included in this study. New settings for existing relays shall be covered within this study.

5. Arc Flash Analysis Study:

   a. An arc flash study shall be performed to select the proper PPE labeling.
   b. Study shall follow procedures as outlined in IEEE 1584.
   c. Provide labeling at all equipment as required by NFPA 70E 130.5.
   d. Labeling shall indicate required level of PPE, nominal system voltage and arc flash boundary.

6. Study Report:

   a. The results of the power-system studies shall be summarized in a final report.
   b. The report shall include the following sections:
      1) Description, purpose, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study
      2) Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.
      3) Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
      4) Fault-current tabulations including a definition of terms and a guide for interpretation.

7. Implementation: The Contractor shall engage an independent testing firm for the purpose of inspecting, setting, testing, and calibrating the protective relays, circuit breakers, fuses, and other applicable devices as recommended in the power-system study report.

3.05 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be PVC only.

B. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".

C. Wires for pulling into raceways for feeders shall be limited to "THWN".

D. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

E. Final connections of flexible conduit shall be neoprene sheathed.

F. Apply one (1) layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.

G. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be PVC.

H. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.

I. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.

J. Panels shall be equipped with doors without exception.

K. The following shall be interpreted as damp or wet locations within building confines:

1. Spaces where any designations indicating weatherproof (WP) or vapor proof appear on the Contract Drawings.

2. Below waterproofing in slabs applied directly on grade.

3. Spaces defined as wet or damp locations by Article 100 of the National Electric Code.

3.06 UNDERGROUND CONDUIT BANKS

A. The Electrical work required in conjunction with underground conduit banks shall include providing all conduits.

B. Conduits for underground banks shall be:

1. Trade diameter size as indicated but in no case less than one inch.

2. Polyvinyl chloride Schedule 40 (approved for encased burial) duct, rigid steel conduit for vertical elbows and straight sections used to penetrate equipment pads, building foundation walls and concrete slabs.

C. All conduits indicated as being incorporated into conduit banks unless specifically noted as rigid steel conduits shall be encased in a concrete envelope which accommodates the indicated configuration of conduits and which encompasses dimensions as follows:

1. Outside surfaces of conduits to outside surface of envelope where reinforcement of encasement is required – 6” minimum.

2. Outside surfaces of conduits to outside surface of envelope where no reinforcement of encasement is required – 3” minimum.

3. Spacing between centerlines of conduits assigned to different categories of use primary feeders, secondary feeders, communications and signaling – 10-1/2” minimum.

4. Spacing between centerlines of conduits assigned to the same category of use – 7-1/2” minimum.

D. Reinforcement of the concrete encasement for conduit banks where required shall consist of No. 4 longitudinal reinforcing bars located 3” from the outside surface of the envelope and spaced 6” on centers all around. No. 8 wire reinforcing hoops set 8” apart shall be used to tie the longitudinal bars together.

E. Install conduit in such a manner as to provide a minimum cover of 30 inches after final grading except the cover may be reduced to a minimum of 18 inches to:

1. Tie into existing work.

2. Pass over other underground utilities.

3. Pass over underground obstructions.

4. Assist in the avoidance of low points.

F. Increase the minimum cover where required by field conditions.

G. Lay conduit to avoid low points during run. Pitch at a minimum of 3 inches per 100 feet away from building.

H. Provide reinforcement for the concrete encasement of a conduit bank where:

1. It passes under or over underground utilities.

2. It passes under or over underground obstructions.

3. Its cover is reduced to less than 30 inches.

4. It runs through foundation walls and other building construction.

I. Concrete encasement reinforcing shall extend in each case 5 feet beyond the points at which the determining conditions terminate.

J. Bends in conduit shall have minimum radii as follows:

1. For primary feeder 15’-0” except where specifically indicated otherwise or where turning up at termination point.

2. For primary feeder turning up at termination point – 4’-0”.

K. Install conduit so that adjacent joints are staggered at least 6 inches from one another.

L. Offsets to accommodate field conditions shall be accomplished with two (2) bends of not more than ten (10) degrees each.

M. Plug both ends of all conduit stubs.

N. Seal the end of each conduit run terminating inside a building utilizing a water and gas-tight sealant manufactured specifically for the purpose.

O. After conduit has been installed with concrete encasement completed, clear each conduit of all obstructions and foreign matter by pulling a flexible mandrel (12” minimum length and a diameter 1/4" less than that of the conduit) and brush through it. In the event that obstructions are encountered in any conduit which will not permit the mandrel to pass, remove and replace the blocked section. Include in the electric work all excavation, backfilling, repair of concrete encasement and restoration of surface at grade involved in the conduit replacement.

P. Provide a nylon cord for the pulling of cable in each conduit in which no cable is to be installed as part of the electric work.

Q. The Electrical Subcontractor shall provide all insulated racks as required for proper support of all cables and wires.

R. Provide magnetic warning tape above each full length of duct bank 12 inches below grade.

3.07 IDENTIFICATION AND TAGGING

A. Identify individually:

1. Each panelboard.

2. Each switch and circuit breaker.

3. Each feeder, wire or cable or all systems.

4. Each end of nylon pullwire in empty conduit.

B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.

C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.

D. The nomenclature used to identify switches or circuit breakers shall:

1. Where they disconnect mains or services designate this fact.

2. Where they control feeders, designate the feeder number and the name of the load supplied.

3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.

E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.

F. Identification for panelboards or load centers shall be by means of engraved Lamacoid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.

G. Identification for switches or circuit breakers shall be by means of the following:

1. Where individually enclosed – engraved Lamacoid nameplates showing 1/8” high white lettering on a black background fastened on the outside front face of the enclosure.

2. Where in panelboards or load centers without doors – same as for individually enclosed.

3. Where in panelboards or load centers with doors – typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.

H. Identification for wires and cables shall be by means of wrap around “brady” type labels.

I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8” high letters suitably describing the equipment controlled or indicated.

J. Phase identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each panelboard. The letters shall be visible from at least one (1) “normal posture” location without having to demount any current carrying or supporting elements.

K. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for

wires of a future system by means of indelible markings on the inside denoting the system.

L. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

3.08 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work in accordance with field instructions issued by the Architect to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the Electrical work.

B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.

C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

3.09 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, Local Electric Code and the following:

1. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a freestanding position.

2. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.

3. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼” air space between the building surfaces and the work. Provide ¾” thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.

4. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.

5. Nothing shall rest on, or depend for support on, suspended ceiling media.

6. Support less than 2” trade size, vertically run, conduits at intervals no greater than 8’. Support such conduits, 2-1/2” trade size or larger, at intervals no greater than they story height, or 15’, whichever is smaller.

7. Where they are not embedded in concrete, support less than 1” trade size, horizontally run, conduits at intervals no greater than 7’. Support such conduits, 1” trade size or larger, at intervals no greater than 10’.

8. Support all lighting fixtures directly from structural slab, intermediate decking or framing member as directed by the Architect. No light fixtures shall be supported directly from the roof deck.

9. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening

frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.

10. Support all runs of conduit and/or circuitry directly from structural slabs, intermediate decking or framing members.

11. Fasten electric work to building structure in accordance with the best industry practice.

12. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.

13. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.

14. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.

15. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:

    a. At field poured concrete slabs, utilize inserts with 20’ minimum length slip-through steel rods, set transverse to reinforcing steel.

3.10 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.

B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.

C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring “wire nut” type connectors. Exclude “wire nuts” employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.

D. Join, tap and terminate standard conductors No. 6 AWG and larger by means of solder sleeves, taps, and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by a means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.

F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry

which utilize device terminals as the splicing points.

G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.

H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communication purposes.

I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

3.11 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2” trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by a 3-1/2” diameter ball mandrel.

C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.

D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10’. Supports shall be located in accessible pull boxes. Supports shall be of a non-deteriorating insulating material manufactured specifically for the purpose.

E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

3.12 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall-mounted outlet boxes shall not be set back to back but shall be offset at least 12” horizontally regardless of any indication on the Contract Drawings.

B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.

C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)

1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side, (or the face of any applied raised cover) penetrates through to within 1/8” of the exposed surface of the building materials concealing the circuitry and

apply a blank or device plate to suit the functional requirements.

2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.

3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.

4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non-demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than 1' away from the building construction opening occupied by the demountable items.

D. Apply junction and pull boxes in accordance with the following:

1. Include all pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.

2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.

3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.

4. Include all required junction and pull boxes regardless of indications on the Contract Drawings (which, due to symbolic methods of notation, may omit to show some of them).

E. Apply outlet boxes in accordance with the following:

1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.

2. A continuous row of fixtures of the end-to-end channel type, designed for "through wiring", and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.

3. A series of separate fixtures, designed for "through wiring", spaced not more than 4' apart, and inter-connected with conduit or raceway and circuitry which is in accordance with the Specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.

4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one (1), but not more than four (4) such fixtures are connected into a single outlet box. When adopting this procedure:

   a. Utilize an outlet box no smaller than 5" square by 2-1/2" deep.
   b. Allow no fixture to be supplied from an outlet box in another room.

5. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.

6. Include all required outlet boxes regardless of indications on the Contract Drawings (which due to symbolic methods of notation, may omit to show some of them).

F. Install junction boxes, pull boxes and outlet boxes in conjunction with concealed circuitry.

1. Exclude surface-mounted outlet boxes in conjunction with concealed circuitry.

2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.

3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.

4. Outlet boxes for switches shall be located at the strike side of doors. Indicate door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.

5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.

6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.

G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.

1. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.13 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:

1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.

2. Horizontally and vertically in mechanical equipment spaces.

3. Horizontally and vertically in electric equipment rooms.

B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.

C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field-poured structural building construction concrete fill or slab shall conform to the following:

1. All proposed embedded raceways shall be indicated on plan and elevation and submitted to the Architect and Structural Engineer for review and written approval prior to installation. Any costs associated with the review and approval shall be borne by the Electrical Subcontractor.

2. They shall be run “single layer” with their outside surface no closer than 1” to any surface of the structural concrete.

3. They shall not be located in any configuration which places the outside surface of one closer than 3” to outside surface of another, except at tees, crosses or other single level wide angle junction points.

4. Where crossovers or close grouping are unavoidable, circuitry shall be carefully field coordinated so as not to cause structural weakness.

5. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.

6. They shall be routed in such a manner as to coordinate with the structural requirements of the building.

7. They shall be routed in accordance with field instructions issued by the Architect where such instructions differ from Specifications set forth herein.

D. Circuitry run exposed shall be routed parallel to building walls and column lines.

E. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.

F. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.

G. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:

1. Crossing where uninsulated: 3”.

2. Crossing where insulated: 1”

3. Running parallel where uninsulated: 36”.

4. Running parallel where insulated: 6”.

H. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the “final connection” outlet boxes themselves shall be located within or open into, the confines of the shaft.

I. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

3.14 INSTALLING CIRCUITRY

A. The outside surface of circuitry, which is to be embedded in cinder concrete, shall be coated with asphaltum paint.

B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four (4) right angle bends or the equivalent thereof.

C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2” trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.

D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying “going” current are not separated from conductors of the same feeder or circuitry carrying “return” current by any ferrous or other metal. Where not within raceways, all “going” and “return” current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.

E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suit the water condition encountered in the field.

3.15 EXCAVATION AND BACKFILLING FOR UNDERGROUND ENCLOSURES

A. Provide excavation and backfilling include minimum 6” gravel Base under the hand hole assembly with the gravel 3” to 4” wider than the sides of the hand hole. (Internal Bracing may be warranted for any manufacturer’s underground enclosure if 95% compaction is required or if heavy vehicles are going to be present during construction and/or throughout the life of the enclosure. See manufacturer recommended practices and instruction including applicable sizes that would require internal bracing).

END OF SECTION 26 00 00