P r o j e c t M a n u a l

Logan Place SRO Apartments

52 Frederick Street Portland, Maine

Portland, Maine
February 6, 2004

Issued for: Construction

Development Team

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FEBRUARY 6, 2004

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Part I
Division 0

Bidding and Contract Requirements

SECTION 00300

INFORMATION AVAILABLE TO BIDDERS

1.1 CONTRACT ZONE AGREEMENT

A. Contract Zone Agreement as executed between the City of Portland and YC Portland, LP and Avesta Housing Development Corporation, pages 1 through 9.

1.2 SUBSURFACE INVESTIGATION REPORT

A. Report of subsurface investigations and recommendations SW Cole Engineering dated September 4, 2003, pages 1-12; Attachement A, Limitations; Exploration Location Plan (full sized print included in drawings); Boring Logs B1-5, B101-2 and B201-5; Sheet 14 - Key to the Notes and Symbols; Sheet 15 – Consolidation Tests; Sheet 16 – General Excavation, Underdrain and Backfill Detail.

B. This report identifies properties of below grade conditions, prepared primarily for the use of the Architect/Engineer.

C. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations may be considered so as to address any concerns, with resulting credits or expenditures to the Contract Price/Sum accruing to the Owner. The contractor shall work with the owner toward expeditious resolution of any unforeseen site issues.

1.3 Davis Bacon Wage Determinations

A. A copy of the current wage determinations as applicable to the Davis Bacon Act is attached hereto and titles as follows:

GENERAL DECISION ME20030013 June 13, 2003 ME13

1.4 Sample Construction Sign

… END OF SECTION

Part II
Division 1

General Requirement

SECTION 01001

BASIC REQUIREMENTS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Summary of Work: Contract, work by owner, contractor use of premises, future work.

B. Contract Considerations: Cash allowances, contingency allowance, inspection and testing allowances, schedule of values, applications for payment, change procedures, alternates.

C. Coordination and Meetings: Coordination, field engineering, cutting and patching, meetings, progress meetings, equipment electrical characteristics and components, examination, preparation, cutting and patching.

D. Submittals: Submittal procedures, construction progress schedules, proposed products list, shop drawings, product data, samples, manufacturers' installation instructions, manufacturers' certificates.

E. Quality Control: Quality assurance - control of installation, Tolerances, References, Mock-ups, Inspection and testing laboratory services, Manufacturers' field services and reports.

F. Construction Facilities and Temporary Controls: Temporary electricity, temporary lighting for construction purposes, temporary heat, temporary ventilation, telephone service, temporary water service, temporary sanitary facilities, barriers and fencing, water control, exterior enclosures, interior enclosures, protection of installed work, security, access roads, parking, progress cleaning and waste removal, project identification, field offices and sheds, removal of utilities, facilities, and controls.

G. Material and Equipment: Products, transportation, handling, storage, and protection, products options, substitutions.

H. Starting of Systems: Starting systems, demonstration and instructions, testing, adjusting and balancing.

I. Contract Closeout: Contract closeout procedures, final cleaning, adjusting, project record documents, operation and maintenance data, spare parts and maintenance materials, warranties.

1.2 WORK BY OWNER

A. Items noted as NIC (Not in Contract), will be furnished and installed by Owner beginning at Substantial Completion.

1.3 DAVIS BACON REPORTING AND WAGE DETERMINATIONS

A. The construction of this project is governed by the Davis Bacon Act. A current wage determination schedule is attached. The General Contractor and its sub contractors are responsible for meeting all of the wage and reporting requirements of the Davis Bacon Act.

1.4 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow:
   1. Owner occupancy.
   2. Work by others and work by owner.
   3. Use of premises by public.

1.5 SCHEDULE OF VALUES

A. Submit schedule on AIA G703 (Requisition Continuation Sheet) standard form, similar electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

1.6 APPLICATIONS FOR PAYMENT

A. Submit five copies of each application on AIA G702 (Requisition Form), similar electronic media printout will be considered.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Monthly.

1.7 CASH ALLOWANCES

A. Costs Included in Allowances: Cost of Product to Contractor or subcontractor and applicable taxes, less applicable trade discounts and delivery to site.

B. Costs Not Included in Allowances But Included in Contract Sum/Price: Product delivery to site and handling at the site, including unloading, uncrating, and storage; protection of Products from elements and from damage and labor for installation and finishing.

C. Difference in cost will be adjusted by Change Order.

D. Allowances Schedule:

1.	Utility Company Connections Fees	$25,000.00
2.	Permanent Project Signage	$3,000.00

1.8 TESTING AND INSPECTION

A. Testing and Inspection: Include in the contract sum the cost of all material testing, including compaction and concrete testing and inspections as specified in the contract documents and shall include the cost of engaging testing or inspection firm, execution of tests or inspection, and reporting of results, incidental labor and facilities required to assist testing or inspection firm, costs of re-testing upon failure of previous tests as determined by Architect/Engineer.

1.9 CHANGE PROCEDURES

A. Stipulated Sum/Price Change Order: Based on Proposal Request with General Contractor profit and overhead delineated and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

B. Change Order Forms: AIA G701 (Change Order Form), similar electronic media printout will be considered.

C. Change Orders must be approved by MSHA, a representative of the Construction Lender, the Owner and the Architect.

1.10 UNIT PRICES (Not Used)

1.11 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.

B. Coordinate related Work and modify surrounding Work as required.

C. Schedule of Alternates:

1. **Alternate No.1**: Replace Paradigm Windows (Base Bid) with Andersen Windows (see Window Schedule and Alternate Window Schedule).

1.12 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements. No claims for additional Time will be considered if the Work has not been properly coordinated.

B. Verify utility requirement characteristics of operating equipment are compatible with building utilities.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

D. In finished areas, conceal pipes, ducts, and wiring within the construction.

1.13 FIELD ENGINEERING

A. Employ a Land Surveyor to locate a reference datum and protect survey control and reference points.

B. Establish elevations, lines, and levels and certify that elevations and locations of the Work conform with the Contract Documents.

C. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

1.14 PRECONSTRUCTION PREINSTALLATION MEETINGS

A. Owner will schedule a preconstruction meeting for all affected parties.

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

1.15 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.

B. Preside at meetings, record minutes, and distribute copies within two days to those affected by decisions made.

1.16 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Motors: NEMA MG1 Type; specific motor type is specified in individual specification sections.

B. Wiring Terminations: Terminal lugs to match branch circuit conductor; size terminal lugs to NFPA 70.

C. Cord and Plug: Minimum 6 foot cord and plug including grounding connector; cord of longer length is specified in individual sections.

1.17 CUTTING AND PATCHING

A. Employ original installer to perform cutting and patching new Work; restore Work with new Products.

B. Submit written request in advance of cutting or altering structural or building enclosure elements.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

E. Cut from finished side of surfaces to concealed side.

F. Protect existing construction from damage during cutting and patching.

G. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

H. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. Refinish surfaces to match adjacent finishes in a manner that will eliminate evidence of patching and refinishing.

1.18 SUBMITTAL PROCEDURES

A. Submittal form to identify Project, Contractor, Subcontractor or supplier; and pertinent Contract Document references.

B. Submittals to Architect shall consist of two prints and one sepia if larger than 11”X17” and 3 copies if 11”X17” or smaller. Submittals will be reviewed by Architect/Engineer and sepia will be marked and returned for printing of distribution set with architect’s/engineer's comments included.

C. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

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

E. All submittals shall conform to the requirements of the Contract Documents and, thus, presentation of a submittal shall represent by the contractor that the product is in conformance. Products that that do not conform with the Contract Documents shall be presented for review as Substitutions (see Substitutions, below).

F. Revise and resubmit submittals as required; identify all changes made since previous submittal.

G. Distribute submittals reviewed by Architect/Engineer to project site and all affected parties.

H. Allow 15 working days for review and return of submittals by architect.

I. Do not allow submittals requiring Architect/Engineer’s action stamp to be used on the project site without marking.

J. Architect/Engineer’s action stamp is self-explanatory.

1.19 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 15 days after date of Owner-Contractor Agreement for Architect/Engineer review.

B. Submit revised schedules with each Application for Payment, identifying changes since previous version. Indicate estimated percentage of completion for each item of Work at each submission.

C. Submit a horizontal bar chart with separate line for each major section of Work or operation, identifying first workday of each week.

1.20 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement, submit list of major Products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.21 PROPOSED SUBCONTRACTOR/SUPPLIER LIST

A. Within 15 days after date of Owner-Contractor Agreement, submit list of major subcontractors/suppliers proposed, with indication of trade/product type.

1.22 PRODUCT DATA

A. Product Data For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in CONTRACT CLOSEOUT.

B. Product Data For Information:

1. Submitted for the Architect/Engineer's benefit as contract administrator or for the Owner.

C. Product Data For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies which the Contractor requires, plus three copies which will be retained by the Architect/Engineer.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this project.

1.23 SHOP DRAWINGS

A. Shop Drawings For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

2. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents purposes described in CONTRACT CLOSEOUT.

B. Shop Drawings For Information:

1. Submitted for the Architect/Engineer's benefit as contract administrator or for the Owner.

C. Shop Drawings For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Architect/Engineer.

1.24 SAMPLES

A. Samples For Review:

1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in CONTRACT CLOSEOUT.

B. Samples For Information:

1. Submitted for the Architect/Engineer's benefit as contract administrator or for the Owner.

C. Samples For Selection:

1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.

2. Submit samples of finishes from the full range of manufacturers' standard colors, in custom colors selected, textures, and patterns for Architect/Engineer selection.

3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in CONTRACT CLOSEOUT.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product.

E. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect/Engineer's selection.

1.25 MANUFACTURER INSTALLATION INSTRUCTIONS

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

1.26 MANUFACTURER CERTIFICATES

A. When specified in individual specification sections, submit certifications by manufacturer to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.27 QUALITY ASSURANCE - CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions.

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

1.28 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that utility services are available, of the correct characteristics, and in the correct location.

1.29 PREPARATION

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

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

1.30 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed Products over suppliers, manufacturers, Products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturers' tolerances.

1.31 REFERENCES

A. Conform to reference standards by date of issue current as of date of Contract Documents.

B. Should specified reference standard conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Reference Standards have the same force and effect as if bound herein and include publications of the following:

1. Maine State Housing Authority (MSHA) Supplemental Construction Standards
2. American National Standards Institute (ANSI).
3. American Concrete Institute (ACI).
4. American Institute of Steel Construction (AISC).
5. American Plywood Association (APA).
6. American Society for Testing and Materials (ASTM).
7. American Society of Civil Engineers (ASCE).
8. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE).
9. American Society of Mechanical Engineers (ASME).

10. Americans with Disabilities Act (ADA).
11. American Water Works Association (AWWA).
12. American Welding Society (AWS).
13. Building Officials and Code Administrators International Inc. (BOCA).
14. Consumer Product Safety Commission (CSPC).
15. Factory Mutual (FM).
16. National Electric Manufacturers Association (NEMA).
17. National Fire Protection Association (NFPA).
18. Underwriters Laboratories, Inc. (UL).
19. US Department of Commerce, National Bureau of Standards (NBS).
20. Federal, State and local codes and regulations.

1.32 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in respective product specification sections.

B. Accepted mock-ups are representative of quality required for the Work.

C. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.33 TESTING AND INSPECTION LABORATORY SERVICES

A. Owner will appoint and employ services of independent firm to perform testing and inspection. Pay for services from specified Cash Allowance.

B. Independent firm will perform tests, inspections, and other services as required.

C. Cooperate with independent firm; furnish samples as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to Contractor.

1.34 CORRELATION AND INTENT

A. Contract Documents are complementary, and elements of the Work required by one shall be as binding as if required by all. The intent of the Documents is to include all items necessary for the proper execution and completion of the Work.

B. Where discrepancies or conflicting requirements exist among the Contract Documents and/or applicable reference standards, the Contractor shall assume the greater quantity or quality level, normally the most costly. Refer conflicting requirements to the Architect/Engineer for interpretation before proceeding.

1.35 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, to initiate instructions and conduct warranty inspections when necessary.

B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturers' written instructions.

1.36 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify utility services are available, of correct characteristics, and in correct location.

1.37 PREPARATION

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

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

1.38 TEMPORARY ELECTRICITY

A. Cost: Contractor shall provide and pay for power service required from source.

B. Provide temporary electricity and power outlets for construction operations, connections, branch wiring, distribution boxes, and flexible power cords as required. Do not disrupt Owner's need for continuous service.

1.39 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain temporary lighting for construction operations.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Permanent building lighting may not be utilized during construction. Repair, clean, and replace lamps to achieve new condition at end of construction.

1.40 TEMPORARY HEAT

A. Provide heating devices with temporary units and heat as needed to maintain specified conditions for construction operations.

B. Pay cost of energy used.

C. Provide and pay for operation as per manufacturers recommended procedures, maintenance, and regular replacement of filters and worn or consumed parts.

D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.41 TEMPORARY VENTILATION

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

1.42 TELEPHONE SERVICE

A. Provide, maintain and pay for telephone and telephone facsimile service to field office at time of project mobilization. Allow Owner, Architect/Engineer and inspecting authorities incidental use.

1.43 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service required for construction operations.

1.44 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. New facilities may not be used.

B. Maintain in clean and sanitary condition.

1.45 BARRIERS AND FENCING

A. Provide barriers and/or fencing to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage.

B. Construction: Contractor's option, as allowed by authorities having jurisdiction.

1.46 WATER CONTROL

A. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Provide erosion control in accordance with environmental regulations and approvals.

1.47 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closures to exterior openings to permit acceptable working conditions and protection of the Work.

1.48 PROTECTING INSTALLED CONSTRUCTION

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

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

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

D. Prohibit traffic from landscaped areas.

1.49 SECURITY

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

1.50 POLLUTION AND ENVIRONMENTAL CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Provide dust control, erosion and sediment control, noise control, pest control and rodent control to allow for proper execution of the Work.

1.51 ACCESS ROADS

A. Construct and maintain temporary roads accessing public thoroughfares to serve construction area. The use of Pine Grove Lane for construction access is prohibited.

1.52 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel.

1.53 PROGRESS CLEANING AND WASTE REMOVAL

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

1.54 PROJECT IDENTIFICATION

A. Provide an 8 foot wide x 4 foot high project sign of exterior grade plywood and wood frame construction, painted, to Architect/Engineer's design and colors.

B. Erect on site at location established by Architect/Engineer.

1.55 FIELD OFFICES AND SHEDS

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.56 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion review.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

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

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

1.57 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Provide interchangeable components of the same manufacture for components being replaced.

D. Provide Products of the same type from the same manufacturer.

1.58 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Transport, handle, store, and protect Products in accordance with manufacturer's instructions.

1.59 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

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

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions (or equal clause): Submit a request for substitution for any manufacturer not named.

1.60 SUBSTITUTIONS

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date of Owner-Contractor Agreement. .

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

D. Conditions: Substitutions will be considered under the following conditions:

1. Revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the intent of the Contract Documents.
3. The specified product or construction method cannot be provided within the Contract Time, if not due to failure by the Contractor to pursue the work promptly.
4. The specified product or construction method cannot receive approval by governing authorities, and the substitution can be approved.
5. A substantial advantage is offered to the Owner in terms of cost, time or maintenance.
6. The specified product or construction method is not compatible with other materials, and the substitution is compatible.

7. The specified product or construction method cannot receive a required warranty, and the substitution can be warranted.
8. The Contractor will bear the impact of additional cost or time needed to provide the substitution, including design services.
9. The Contractor will be responsible for coordinating the substitution with other Work.

1.61 STARTING SYSTEMS

A. Provide seven days notification prior to start-up of each item.

B. Ensure that each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturers' instructions.

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

1.62 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion. .

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

1.63 TESTING, ADJUSTING, AND BALANCING

A. Contractor will appoint, employ, and pay for services of an independent firm to perform testing, adjusting, and balancing.

B. Reports will be submitted by the independent firm to the Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

C. Cooperate with independent firm; furnish assistance as requested.

D. Re-testing required because of non-conformance to specified requirements will be charged to the Contractor.

1.64 CONTRACT CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Sum/Price, previous payments, and amount remaining due.

1.65 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Thoroughly clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces, wash and polish glass, reflective and smooth hard surfaces.

C. Clean debris from site, roofs, gutters, downspouts, and drainage systems.

D. Replace filters of operating equipment.

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

1.66 ADJUSTING

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

1.67 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section a description of actual Products installed.

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

E. Submit original and two photocopies of record documents to Owner with claim for final Application for Payment.

1.68 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized, with tab titles clearly printed under reinforced laminated plastic tabs.

1.69 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide Products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed obtain receipt prior to final payment.

1.70 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Submit prior to final Application for Payment.

…END OF SECTION

Part II
Division 2

Excavation

SECTION 02100

CLEARING AND GRUBBING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Earthwork - Section 02200.

c. Site Improvements - Section 02460.

d. Landscaping - Section 02500.

PART 2. PRODUCTS

2.1 Materials

a. Seed for erosion control and temporary seeding - Arrostook rye applied at 2.6#/1,000 square feet.

PART 3. EXECUTION

3.1 Protections

a. Provide temporary fences, barricades, coverings or other protections to prevent damage to existing improvements, trees or vegetation indicated on the Drawings to remain.

b. Protect improvements on adjoining properties and on Owner's property.

3.2 Clearing

a. All areas requiring clearing within the Limit of Work area, shown on the Drawings, shall be done in accordance with applicable laws and ordinances. Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing or transplanted. The Contractor shall be responsible for coordinating selective removal of vegetation with the Landscape Architect.

3.3 Grubbing

a. In areas where topsoil is to be removed or disturbed, existing grades shall be grubbed free of stumps, stones, rubbish, roots or other extraneous growth or debris.

b. Dispose of grubbings off Owner's property. Grubbings shall not be buried on site.

SECTION 02200

SITE EARTHWORK

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Geotechnical Report – Section 00300

c. Site Drainage - Section 02400

d. Site Utilities - Section 02420

e. Construction Drawings - Refer to architectural plans and specifications for specific requirements regarding the earthwork beneath the building. Where the architectural plans earthwork requirements for the building subgrade pad are more stringent than those stated herein, the architectural plans and specifications shall govern.

1.2 Utility Easements

a. The Contractor shall contact all utility companies and determine if additional easements will be required to complete the project.

1.3 Standards

a. Conform to all applicable city, county and state codes for excavation, earthwork and disposal of debris.

b. Conform to all applicable standards of the various utility companies.

1.4 Inspection

a. Drawings do not purport to show above ground objects existing on site. Contractor shall visit site and acquaint himself with all observable conditions as they exist before submitting his Bid.

1.5 Grade and Elevations

a. The Drawings indicate, in general, the alignment and finished grade elevations. The Landscape Architect, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference or to adapt piping to other special conditions encountered.

b. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain by means of suitable stakes placed in the field.

1.6 Limit of Work

a. Take special care to keep all operations within the Limit of Work as shown on the Drawings. The Contractor shall take all necessary precautions to protect existing site elements to remain.

1.7 References

a. Where M.D.O.T. appears it shall be taken to mean The State of Maine Department of Transportation Specifications, Highways and Bridges - (Latest Revision).

1.8 Reference Standards

a. The following most current publications form part of this specification to the extent indicated by references thereto and shall be followed for all construction testing:

American Society for Testing and Materials (ASTM):

D 422	Method for Particle Size Analysis of Soils
D 698	Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) hammer and 12-inch (304.8mm) Drop (Standard Proctor)
D 1556	Test for Density of Soil in Place by the Sand Cone Method
D 1557	Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) hammer and 18-inch (457 mm) Drop (Modified Proctor)
D 1559	Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
D 2167	Test for Density of Soil in Place by the Rubber Balloon Method
D 2216	Laboratory Determination of Moisture Content of Soil
D 2487	Classification of Soils for Engineering Purposes
D 2922	Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 3017	Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D 4318	Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils
C 25	Chemical Analysis of Limestone, Quicklime and Hydrated Lime
C 110	Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method
C 618	Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

1.9 Tests

a. Tests for soil density and/or gradations as herein designated shall be taken at the option of the Architect and or Landscape Architect. Costs of testing shall be paid by the Owner.

b. Soil samples representative of the borrow source and suitable laboratory testing shall be furnished by the Contractor for each material listed in Section 2.1. Test results shall be submitted at least two (2) weeks prior to their proposed use or placement on the site. In the event a proposed material does not meet the specified gradation requirements, the material type shall not be placed on-site until an alternative borrow source is selected and the laboratory test results indicate the material meets the specified gradation requirements.

c. Compaction tests shall be determined on the basis of laboratory Proctor tests (ASTM D.1557, Modified Proctor).

d. Field density tests not specified on a comparative basis shall be to the percent density specified in this Section for both earth excavation and earth and granular type fills. Tests shall be in accordance with ASTM D.1556, ASTM D.2167, ASTM D.2922 OR ASTM D.3017.

1.10 Test Pits

a. Test Borings have been made in the area of the proposed building and parking area and the logs can be reviewed in Section 00300.

1.11 Protection of Existing Structures and Utilities

a. Barricade open excavations occurring as part of this work and post with warning signs. Backfilling or secured covering of excavations shall be required.

b. Provide necessary supports, bracing and covering to protect existing and new structures and utilities during all phases of excavation and backfill.

c. Notify appropriate owners before excavating adjacent to poles, cables, pipes, and other utilities.

d. Note that location of existing underground utilities on plans is approximate and may be incomplete. Responsibility for exact locations and protection of all utilities rest with the Contractor. The Contractor shall be responsible for confirming invert elevations for existing and proposed sewer installation and connection. Where location of existing underground utilities differs from that shown on plans, notify the Landscape Architect immediately.

e. Conflicts between existing and new utilities and/or structures to be built under this contract shall be reported to the Landscape Architect or Owner's Representative.

1.12 Erosion and Sedimentation Control

a. The General Contractor shall perform all work necessary to control erosion. Installation of erosion control structures prior to construction shall be performed in accordance with the Standards of the U.S. Department of Agriculture, Soil Conservation Service, "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices" by the Cumberland County SWCD, State of Maine, and as shown on the Plans.

b. Weekly inspections, as well as routine inspections following rain falls, shall be conducted by the Contractor of all temporary and permanent erosion control devices until final acceptance of the project. Necessary repairs shall be made immediately to correct undermining or deterioration. Final acceptance shall include a site inspection to verify the stability of all disturbed areas and slopes. Until final inspection, all erosion and sedimentation control measures shall immediately be cleaned, and repaired by the Contractor after each storm event, as required. Disposal of all temporary erosion control devices shall be the responsibility of the Contractor. Removal of temporary erosion control devices shall not occur until a minimum 75% catch of vegetation occurs or permanent structural measures are in place.

1.13 Removals

a. The Contractor shall perform all work necessary for clearing and grubbing and/or removal, backfill and disposal of all existing materials noted on the Drawings, as well as temporary structures installed for construction.

PART 2. PRODUCTS

2.1 Materials

(1) Fill Materials: Backfill and ordinary fill materials shall be as follows:

a. Materials from excavation: Excavated material which can be readily spread and compacted, and consists of mineral soil, substantially free of organic materials, loam, wood, rubbish or other perishable substance may be used for common fill. Boulders (rocks over eight (8) inches) shall be removed from excavated material before using for fill.

b. Backfill over pipes shall be free of stones over one (1) inch diameter for first one (1) foot over pipes.

c. Aggregate Base, Crushed - M.D.O.T. 703.06, (a), Type A. (No rocks larger than two inches). - Compacted at 95% ASTM D-1557

d. Aggregate Subbase Gravel - M.D.O.T. 703.06, (a), Type C, Size of stone no larger than six (6) inches. - Compacted at 95% ASTM D-1557.

e. Aggregate Subbase Gravel, M.D.O.T. 703.06 (b) Type D (no stone larger than 4 inches – compacted at 95% ASTM D – 1557.

f. Structural Fill - M.D.O.T. 703.06, (a), Type C. Size of stone no larger than six (6) inches, and further limited to a maximum particle size equal to three (3) inches within twelve (12) inches of slab grade. Compacted at 95% ASTM D-1557

g. Aggregate for Foundation Backfill: M.D.O.T. 703.6 (a) Type B. Size of stone no larger than four (4) inches.

h. Gravel Borrow - M.D.O.T. 703.20. Size of stone no larger than six (6) inches. Compacted at 95% ASTM D-1557

i. Drainage Stone - M.D.O.T. 703.22, Type C. - Vibrated with hand vibrating plate.

j. Native silty sand (Glacial till) found on-site can be re-used for subgrade preparation provided that the natural moisture content at the time of placement and compaction is at slightly below optimum moisture as determined by MPMDD. On-site soils should not be utilized as backfill against foundations or as slab-on-grade base material.

(2) Bedding Material: Bedding and Backfill Material for Pipes

a. The refilling of all excavation below the pipe invert and below the crown of the pipes (as indicated by the details) shall be made with crushed stone meeting the following criteria:

Screen Size Square Openings	% by Weight Passing
1- 1/2"	100
1"	90 - 100
1/2"	0 - 15

b. Where ordered by the Landscape Architect to stabilize the trench base or for excavation below grade, use 3/4 inch crushed stone.

c. PVC Pipe and Polyethylene Pipe: Use 1/2 inch to 1 inch crushed stone in the zone twelve (12) inches above and six (6) inches below the pipe.

(3) Sand Blanket

a. Use (over and under insulation) where insulation is installed over pipe or culvert and at such other places as required in the Contract Documents, or when ordered by the Landscape Architect. Clean sand, free from organic matter, so graded that 90 - 100 percent passes a 1/2 inch sieve and not more than 7 percent passes a No. 200 sieve. (**Exception:** For corrugated polyethlene pipe where crushed stone is required over top of pipe).

(4) Suitable Backfill Material

a. Structural fill or natural material excavated during the course of construction, excluding debris, pieces of pavement, organic matter, topsoil, all wet or soft muck, peat, or clay, all excavated ledge material, and all rocks over six (6) inches in largest dimension, or any material which will not provide sufficient support or maintain the completed construction in a stable condition, all approved by the Landscape Architect. (**Exception:** may not be used to backfill foundation or under slab).

(5) Geotextile Materials

a. Acceptable Geotextiles and Geogrids:

(1) Mirafi 600x
(2) Phillips 66 Supac 6WS
(3) Dupont Typar 3401 and 3601
(4) Trevira S1114 and S1120
(5) AMOCO 2006
(6) Tensar SS-1 and SS-2
(7) Exxon GTF-200 or 350
(8) Conwed Stratagrid GB-5033
(9) Miragrid 3xT

b. Filter/Drainage Geotextiles:

(1) Mirafi 160N or equal

c. Silt Fencing Geotextiles:

(1) Mirafi 100x or equal

PART 3. EXECUTION

3.1 Classifications

a. Earth Excavation - Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, any material indicated in the data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

b. Rock Excavation - Removal and disposal of materials encountered that cannot be excavated without continuous and systematic drilling and blasting or continuous use of a ripper or other special equipment except such materials that are classed as earth excavation.

1. Typical Materials: Boulders 2 cu. yd. or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

2. Intermittent drilling performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

c. Footing and Slab on Grade Excavation

1. Refer to the Geotechnical Report in Section 00300 for specific recommendations.

2. Foundation subgrade improvements will require the excavation of all existing fill within the influence zone of the footings and replaced with compacted structural fill. Excavation of all fill material within two (2) feet of slab on grade shall be required and filled with compacted structural fill material.

d. Unauthorized Excavation

1. Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect or Landscape Architect.

2. Under footings or foundation bases, fill unauthorized excavation by filling with Structural Fill and compacting to 95 percent of ASTM D-1557 without altering top elevation.

3.2 Topsoil Removal

a. Topsoil shall be stripped to its entire depth from area within the Limit Of Work and reusable materials shall be temporarily removed from the site, screened, and returned to the site as needed. Stripped topsoil shall be free from clay, large stones, debris, and peat. Topsoil for reuse on site shall be screened and tested in accordance with Section 02500 - Landscaping.

3.3 General Excavation

a. Grades, Dimensions - excavate where indicated and as necessary to obtain subgrades as shown on the Drawings and hereinafter specified. All excavation shall include the satisfactory removal of all materials of whatever substance encountered within the indicated limits. Only suitable materials shall be used or stockpiled for later use in backfill preparation. Disturbed subgrade material shall be removed prior to pouring of footings and replaced with either compacted structural fill or thickened footing concrete. All footing subgrades shall be approved by the owner's representative prior to pouring concrete for footings.

b. The Contractor shall provide temporary drains, ditches and the necessary equipment, as required, to maintain the site of work and adjacent areas in a well drained condition. Keep all excavations free of both ground and surface water at all times. All water pumped or drained from the work shall be disposed of so as not to endanger public health, property or any portion of the work under construction or completed.

c. The Contractor shall provide shoring, sheeting and bracing as may be required to maintain excavations and trenches secure and safe from collapse and to protect adjacent structures.

d. Excavation shall not be made below specified subgrades except where rock or unstable material is encountered. If suitable bearing is not found at levels shown on the Drawings, the Architect and or the Landscape Architect shall be notified in writing immediately so that adjustments or changes may be made. Material removed below specified subgrade without the approval of the Landscape Architect shall be replaced and compacted with an approved gravel at the Contractor's expense.

e. All work shall be carried out in a manner consistent with the regulations of such Federal, State and Local authorities as may have jurisdiction over such activities.

3.4 Summary of Utility Installation

a. Set all lines, elevations and grades for utility and drainage system work and control system for duration of work, including careful maintenance of bench marks, property corners, monuments or other reference points.

b. Perform all excavation for underground piping and utility systems to the depths indicated on the Drawings or as otherwise specified. Trenches shall be excavated by open cut.

c. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation. Repair any surface or subsurface improvements shown on Drawings.

d. Verify location, size, elevation and other pertinent data required to make connections to existing utilities and drainage systems as indicated on Drawings. Contractor shall comply with local codes and regulations.

e. Inspection of stormwater system excavation, utility excavation and backfilling subject to review by utility company, city engineer and third party inspection by project engineer.

3.5 Excavation, Trenching and Backfilling

a. Perform excavation as indicated for specified depths. During excavation, stockpile materials suitable for backfilling in an orderly manner far enough from bank of trench to avoid overloading, slides or cave-ins.

b. Remove excavated materials not required or not suitable for backfill or embankments and waste as specified. Any structures discovered during excavation(s) shall be disposed of as specified.

c. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

d. Open cut excavation with trenching machine or backhoe. Where machines other than ladder or wheel-type trenching machines are used, do not use clods for backfill. Dispose of unsuitable material and provide other suitable material at no additional cost to Owner.

e. Excavations for all foundation work shall be backfilled with structural fill meeting specifications set forth herein.

3.6 Trench Excavation

a. The Contractor shall contact the local utility companies before excavation begins. Dig trench at proper width and depth for laying pipe, conduit or cable. Cut trench banks as nearly vertical as practical and remove stones as necessary to avoid point-bearing. Over-excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide suitable base for continuous and uniform bedding.

b. All trench excavation side walls greater than five (5) feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of the sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches four (4) feet or deeper.

c. Accurately grade trench bottom to provide uniform bearing and support for each section of pipe on bedding material at every point along entire length, except where necessary to excavate for bell holes, proper sealing of pipe joints or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer or wider than needed to make joint connection properly.

d. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 18 inches wider than outside surface of any pipe or conduit that is to be installed to designated elevations and grades. All other trench width requirements for pipe, conduit or cable shall be least practical width that will allow for proper compaction of trench backfill.

e. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances:

   (1) Water Mains: 66 inches to top of pipe barrel.

   (2) Sanitary Sewer: Elevations and grades as indicated on Drawings. Note: Pipe with less then five (5) feet of cover in pavement areas or four (4) feet in landscaped areas, provide two (2) inches of rigid insulation as shown on detail.

   (3) Storm Sewer: Depths, elevations and grades as shown on Drawings. For pipe with less than four (4) feet of cover, provide two (2) inches of rigid insulation per plan and detail.

(4) Electrical Conduits: 40 inches minimum to top of conduit for primary and 30 inches to top of conduit for secondary or as required by NEC 300-5, NE 710-36 codes, or the local utility company requirements, whichever is deeper.

(5) TV Conduits: 18 inches minimum to top of conduit or as required by the local utility company, whichever is deeper.

(6) Telephone Conduits: 18 inches minimum to top of conduit, or as required by the local utility company, whichever is deeper.

3.7 Sheeting and Bracing

a. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen is required. Sheeting may be removed after sufficient backfilling to protect against damaging or injurious caving.

3.8 Pipe Bedding

a. Accurately cut trenches for pipe or conduit that is to be installed to designated elevations and grades to line and grade as specified below bottom of pipe and to width as specified. Place specified depth of bedding material, compact in bottom of trench, and accurately shape to conform to low portion of pipe barrel. After pipe installation, place select bedding material in accordance with details and compact as required.

3.9 Trench Backfilling

a. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact as specified, to properly correct condition in an acceptable manner.

b. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in eight (8) inch maximum loose lifts.

c. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. Compact to minimum density of 95% of maximum dry density in accordance with ASTM D 698 (or 92% of maximum dry density in accordance with ASTM D1557). For utility trenches located in pavement and sidewalk areas, place backfill in eight (8) inch maximum loose lifts and compaction to 95% of ASTM D.1557 maximum dry density.

3.10 Structural Excavation

a. Earth shall be excavated to the depth and sections required for installation of all catchbasins, manholes, footings, floor slabs or other appurtenant facilities to the extent indicated on the Plans. Care shall be taken that the foundation areas of structures are not excavated below subgrade or are disturbed so as to lessen their bearing capacity.

b. All excavations for structures shall be sheeted, braced, sloped, or otherwise protected in the same manner and meeting the safety requirements and conditions specified above under paragraph Section 3.6 (b). Any excess excavated material shall be removed from the site.

3.11 Rock Excavation

a. Soils investigations indicate that removal of rock will not be required for this project. If however, removal of rock is required, the Contractor shall take the following steps:

(1) Uncover and expose material claimed as rock.

(2) Notify the Landscape Architect immediately before proceeding with any work in this regard.

(3) Obtain written consent and approval from local authorities for the methods to be used before proceeding with blasting or related work.

(4) Perform a pre-blast survey of neighboring properties.

(5) Handle and employ explosives as stipulated in the Manual of Accident Prevention in Construction of the A.G.C.

b. Rock excavation shall include boulders over two (2) cubic yards in volume and masses of rock or conglomerate masses requiring systematic drilling and blasting to be removed.

c. Payment

(1) Payment for rock required to be removed shall be based upon a cubic yard basis. Provide ledge removal inspection for quantity verification of ledge removal by the site contractor.

(2) Payment for rock trench excavation shall be calculated to depths of six (6) inches below the bottom of pipes, twelve (12) inches below bottoms of footings, and for a width equal to the diameter of the pipe plus eighteen (18) inches beyond each side. Removal cost shall be based upon a unit cost to include rock removal and required trench backfill material.

(3) Rock excavation removed with open masses but below the required elevation for the mass, as for footing drains, shall not be considered as trench excavation.

(4) Excavation which does not meet the above requirements for Rock Excavation will be classified as General Earth Excavation.

3.12 Drainage

a. The Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose of properly all water entering excavations. Such excavations shall be kept dry until the structures and appurtenances to be built therein, have been completed to such extent that they will not be damaged.

b. Dewatering shall be accomplished in a manner that will preserve the undisturbed state of the foundation soils. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, other surfaces, or property. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work.

c. Temporary underdrains, if used, shall be laid in trenches beneath the grade of the structure. Trenches shall be of suitable dimensions to provide room for the chosen size of underdrain and its surrounding screened gravel.

d. Temporary underdrains, if used, shall be laid at an approved distance below the bottom of the normal excavation and entirely surrounded by screened gravel. The distance between the bottom of the pipe or structure and the top of the bell of the underdrain pipe shall be at least three (3) inches, unless otherwise permitted. The space between the underdrain and the pipe or structure shall be filled with sand meeting the requirements of ASTM Designation C-33 which shall be rammed if necessary and left with a surface suitable for laying the pipe or building structure. Following their use, underdrains shall be plugged as directed by the Landscape Architect.

3.13 Compaction

a. Compaction densities specified herein shall be the percentage of the maximum dry density obtainable at optimum moisture content as determined and controlled in accordance with ASTM D.1557. Field density tests shall be made in accordance with ASTM D.1556, D.2167 or D.2922. Each layer of backfill shall be moistened or dried as required, and shall be compacted to the required densities unless otherwise specified in the project specifications.

c. Fills placed under footings, floor slabs, roads, parking areas and walks shall be compacted to not less than 95 percent of the ASTM D - 1557 maximum dry density.

c. The subbase material placed under the road gravel base in fill areas shall be compacted to not less than 95 percent of the ASTM D1557 maximum density.

d. Fills adjacent to building walls from the exterior face of the building and/or retaining walls to a point not less than 10'-0" from the exterior face of the wall shall be compacted to not less than 92 percent of the ASTM D. 698 maximum compaction dry densities as herein before specified.

e. Bedding material and trench sand under pavement: 95%

f. Bedding material and trench sand non-pavement areas: 92%

g. Loam areas: 90%

h. All other areas: 85%

i. Methods and equipment proposed for compaction shall be subject to the prior acceptance by the Owner's representative. Compaction generally shall be done with vibrating equipment. Displacement of, or injury to the pipe and structure shall be avoided. Movement of in-place pipe or structures shall be at the Contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the Landscape Architect and at the expense of the Contractor.

3.14 Filling and Subgrade Preparation - Building Area

a. **The recommendations for filling and subgrade preparation for the building area as stated in the Geotechnical Report, prepared by S.W. Cole Engineering, dated September 4, 2003, shall govern.**

b. Building subgrade pad shall be that portion of site directly beneath and ten feet (10') beyond the building and appurtenant limits.

c. Unless specifically indicated otherwise on the Drawings, areas exposed by excavation or stripping and on which building subgrade preparations are to be performed, shall be compacted to a minimum of 95% of the Modified Proctor Maximum Dry Density (MPMDD). Building floor slab subgrades consisting of native sands, silty sands shall be compacted with a 15 ton highway roller to achieve 95% of MPMDD to a minimum of 12 inches.

d. Any soft areas revealed during compaction of the base of the excavation should be excavated and replaced with structural fill per this specification.

e. Building floor slab fill areas shall be filled (two feet below slab) with structural fill not to exceed 12 inch loose lifts and compacted to 95% of MPMDD. Footing subgrades consisting of sands or silty sands or structural fill material shall be compacted to 95% of MPMMDD, loose lifts not to exceed twelve (12) inches(two feet below slab).

f. Unless specifically indicated otherwise on the Drawings, Structural Fill materials used in preparation of building subgrade shall be placed in lifts or layers not to exceed twelve (12) inches loose measure and compacted to a minimum of 95% of the M.P.M.D.D.

g. All fill material shall be free of snow, ice, or foreign contaminants before placement. All lifts placed during winter construction shall be compacted by the end of the work day. Any lifts exposed to ice, snow and freezing conditions prior to compaction shall be removed at the Contractor's expense.

3.15 Filling and Subgrade Preparation - Exclusive of Building Area

a. **The recommendations for filling and subgrade preparation for the building area as stated in the Geotechnical Report, prepared by S.W. Cole Engineering, dated September 4, 2003, shall govern.**

b. All materials shall be placed and compacted to conform to the lines, elevations and cross-sections indicated on the Drawings. Do not start fills until the area has been inspected and approved by the Landscape Architect or Owner's Representative.

c. Fill shall not be placed on a surface of frozen material, nor shall snow, ice, frozen earth or debris be incorporated in the fill. All materials shall be approved by the Landscape Architect or Owner's Representative before being placed.

d. Unless specifically stated otherwise on the Drawings, areas exposed by excavation or stripping and on which subgrade preparations are to be performed, shall be compacted to a minimum of 95% of maximum dry density, in accordance with ASTM D 1557. Subgrades consisting of native sands or silty sands shall be compacted with a 15 ton highway roller. These areas shall then be proof-rolled to detect any areas of insufficient compaction. Proof-rolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions. Areas of failure shall be excavated and recompacted as stated above.

e. If sufficient suitable fill material is not available from excavations under this Contract, additional fill, suitable for use, shall be brought to the site from other sources. Subgrade fill in pavement areas shall consist of Gravel Borrow (M.D.O.T. 703.20) or Structural Fill (MeDOT 703.06 (a) Type C. Place in maximum 12 inch layers and compact to 92 percent of maximum density in accordance with ASTM D 1557. Each layer shall be free from ruts and shall meet compaction requirements before next layer is placed. Maintain layers with crown or other practical means of drainage.

f. Stones in fills shall be well distributed. Do not have stones over six (6) inches in diameter within twelve (12) inches of subgrade.

3.16 Finish Grading

a. Grade all areas where finish grade elevations or contours are indicated on Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below established finished subgrade elevation, and all ground surfaces shall vary uniformly between indicated elevations. Ditches and swales shall be graded to allow for proper drainage without ponding and in a manner that will minimize erosion potential. For topsoil application, refer to Section 02500-LANDSCAPING.

b. Correct all settlement and eroded areas within one year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace any grass, shrubs, trees or other vegetation disturbed by construction using corrective measures.

3.17 Field Quality Control

a. If Owner elects to test, an independent testing laboratory selected and paid by the Owner shall be retained to perform construction testing on site. Field density test may be ordered for each foot of depth of backfill at an average of 200 feet along the trench.

b. If compaction requirements are not complied with at any time during the construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.

c. The independent testing laboratory shall prepare test reports that indicate test location, elevation data and test results. The Owner, Architect and Contractor shall be provided with copies of reports within 72 hours of time test was performed. In the event that any test performed fails to meet these Specifications, the Owner and Contractor shall be notified immediately by the independent testing laboratory.

d. All costs related to retesting due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to employ an independent testing laboratory and to direct any testing that is deemed necessary. Contractor shall provide free access to site for testing activities.

3.18 Testing

a. Field density test may be ordered by the Landscape Architect for each foot of depth of backfill at an average interval of 200 feet along the trench.

b. The Contractor shall furnish all necessary samples for laboratory tests and shall provide assistance and cooperation during field tests. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.

c. Any costs of re-testing required as a result of failure to meet compaction requirements shall be borne by the Contractor.

3.19 Work In Public Streets

a. Work done in existing Municipal streets shall be done in accordance with local and/or State requirements as applicable.

3.20 Clean-up

a. The Contractor shall remove all debris, construction equipment, and material from the areas to be loamed and seeded.

SECTION 02400

SITE DRAINAGE

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Geotechnical Report - Section 00300

c. Site Earthwork - Section 02200

d. Construction Drawings

1.2 Quality Assurance

a. It is the intention of this Section that the catchbasins, manholes and other structures, including all component parts, have adequate space and strength considered necessary for the intended service. Space requirements and configurations shall be as shown on the Drawings.

b. Catchbasins and manholes shall be an assembly of precast sections with or without steel reinforcement, with approved jointing. In any approved structures, the complete structure shall be of such material and quality as to withstand loads of eight (8) tons (H-20 loading) without failure, continuously for the life of the structure. Assume a period in excess of 25 years for all structures.

1.3 Submittals

a. The Contractor shall submit the following information with sets of As-Built Drawings:

(1) Shop Drawings of pipe and precast units, catchbasins and manholes.

(2) Manufacturer's information of joint sealants, gaskets and waterproofing.

(3) Storm drain pipe. Pipe of the same manufacturer shall be used throughout the project.

(4) Source and gradation reports for soil materials.

(5) Manufacturer's information of physical, filtration/hydraulic, and mechanical properties of geotextile fabrics.

(6) Drainage stone source and gradation analysis report.

(7) Structural fill source and gradation analysis report.

1.4 Delivery, Storage and Handling

a. Exercise care when handling pipe to prevent damage to pipe and finish.

b. Immediately remove damaged materials and replace at no additional cost to the Owner.

c. Store materials above ground on platforms, skids, or other adequate supports.

d. Protect geotextiles from ultraviolet light in accordance with manufacturer's requirements.

PART 2. PRODUCTS

2.1 Materials

a. Catchbasin and Manhole: All structures shall conform to the City of Portland Technical and Design Standards and Guidelines - Latest Edition. Structures shall be precast concrete structures, 4 foot interior diameter, unless otherwise specified, as manufactured by Superior Concrete or approved equal with T & G joints and rubber ring or asphalt filler seals.

(1) Bases - Precast sumps conforming to ASTM C478. Holes for pipes cast into the base section shall have a three (3) foot minimum clear distance between the inside bottom of the base section and the pipe invert.

(2) Barrels - Precast sections of correct height, conforming to ASTM C478 or solid concrete barrel blocks conforming to ASTM C-139.

(3) Cones - Precast, hunched type, conforming to ASTM C478.

(4) Pipe to Catchbasin Joints: Only as approved by the Landscape Architect and, in general, will depend on water-tightness upon a rubber boot either cast-in-place or press-wedged in place.

(5) Frames and Grates to conform to AASHTO M-105, Class 30, of gray cast iron by Etheridge Foundary. Refer to Drawings for type and size.

(6) Each section of the precast structure shall have two holes for the purpose of handling and setting. The holes shall be tapered and shall be plugged with nonshrink mortar or grout in combination with concrete plugs after installation. Note: For storm drain sections that serve as cutoff drains for grounwater, provide 1/4 inch perforations along the top of pipe. Refer to project details and plans.

b. Storm Drain Pipe: PVC Pipe, Reinforced Concrete Pipe or Corrugated Polyethylene Pipe (refer to Drawings). Furnish as indicated on Drawings and of size shown. Provide couplings and special bends or elbows as shown or required by the work.

(1) Polyvinyl Chloride (PVC) Pipe: Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant.

(2) Reinforced Concrete Pipe (RCP): Comply with requirements of ASTM C 76, Class III unless another class type is indicated on Drawings, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.

(3) Corrugated Polyethylene Pipe (CPP) Smooth Interior: Conform with AASHTO Designations M 294 and M252. Pipe must be installed in accordance with pipe manufacturers installation Guidelines for Culvert and Other Heavy-Duty Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. (ADS) N-12) & Hancore, Inc. (Hi-Q smooth interior).

(4) Foundation Drains: Pipe shall be perforated PVC pipe having a SDR of 35 or equivalent. Perforations shall consist of 3/8 inch diameter holes.

c. Brick: Comply with the ASTM Standard Specifications for Sewer Brick, Designation C32, for Grade SS, hard brick.

d. Cement: Shall be Type II. Concrete shall have a minimum strength of 3,000 psi at 28 days.

e. Structural Fill for foundation drain backfill - M.D.O.T. 703.06, (a), Type C.

f. Drainage Stone: M.D.O.T. 703.22 Type C. 3/8 - inch, pea stone or 3/4-inch crushed stone

g. Geotextiles: Shall be Mirafi 160 N or equivalent for filtration fabric or equivalent.

PART 3. EXECUTION

3.1 Catchbasins and Manholes

a. After the excavation has been done and leveled, six (6) inches of bedding material shall be put in the bottom of the excavation, leveled and thoroughly compacted.

b. Precast concrete sections shall be set so as to be vertical and with section in true alignment, 1/4-inch maximum tolerance to be allowed.

c. Invert channels of manholes may be formed in 3,000 psi concrete or using brick. When brick is used, use Portland cement, ASTM C 150, Type II. Masonary cements shall not be used. The top shelf shall slope to drain towards the flowing through channel.

d. The top of the precast reinforced concrete unit shall be set at a grade that will allow a minimum of two (2) courses and a maximum of three (3) courses of brick and mortar before setting the cast-iron frame. Mortar for brick masonry shall be Portland cement, Type II, mixed in the proportion of one part cement to two parts sand, worked to the proper consistency.

e. The inside and outside of the masonry work of all catchbasins shall be plastered with 1:2 Portland cement mortar. The thickness of the mortar shall be one-half (1/2) inch, and the mortar shall be carefully spread and thoroughly troweled, leaving a smooth, substantially waterproof surface. The mortar shall be extended to completely cover the outside and inside surfaces of all masonry work. To enhance proper curing, completed masonry shall be covered with a polyethylene plastic sheet or other appropriate means for a minimum of 24 hours before backfilling. The inside and outside of each horizontal joint in the precast manholes shall be filled with joint mortar and trowelled smooth.

f. Backfilling shall be done in a careful manner in 6”-12” lifts and compacted with a vibratory compactor, bringing the fill up evenly on all sides.

g. If any leaks appear in catchbasins, the Contractor shall uncover the structure and disassemble the sections and reconstruct the catchbasin, or perform other acceptable repairs approved by the Landscape Architect so as to secure a watertight structure. The Contractor shall install the precast units and pipeline connectors in a manner that will result in a watertight joint.

h. Catchbasins and manholes shall be constructed as the sections of the pipelines between them are completed, and unless this is done, the Landscape Architect shall have the authority to stop trenching and pipe laying until manhole construction is brought up properly. All ground water shall be kept away from any newly placed concrete or freshly laid masonry work until cement has properly set and until a watertight job is obtained.

3.2 Catchbasin and Manhole Frames and Grates

a. Catchbasin and manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface, or as directed.

b. Frames shall be set concentric with the top of the masonry and in full bed of mortar so that the space between the top of the masonry and the bottom flange of the frame shall be completely filled and made watertight.

c. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on top of the bottom flange. Mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

d. Manhole covers and catchbasin grates shall be left in place in the frames on completion of the other work at the manholes and catchbasins.

3.3 Drain Pipes

a. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.

b. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade, without high spots. Do not drive the pipe down to grade by striking it with a shovel handle, timber, hammer, or any other unyielding object. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawing. Take all necessary precautions to prevent floatation of the pipe in the trench.

c. Temporary Plugs - When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated. Do not use the pipelines as conductors for trench drainage during construction.

d. Jointing - Connect pipe in accordance with the latest manufacturer's instructions and recommendations. Clear each pipe length, coupling and fitting of all debris and dirt before installing. Provide and use coupling pullers for jointing the pipe. Provide gasket feeler gauges for use by the pipe layer for checking the position of the rubber gaskets in the completed joints.

e. Shove home each length of pipe against the pipe previously laid and hold securely in position. Do not pull or cramp joints. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.

f. Pipe Cutting - Cut in accordance with manufacturer's recommendations. Cut the pipe with a hand saw, metal-inserted abrasive wheel or pipe cutter with blades (not rollers). Examine all cut ends for possible cracks caused by cutting.

g. Inspection - Pipe installation shall be subject to inspection by the Landscape Architect for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Landscape Architect shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the Landscape Architect.

3.4 Foundation Drain Pipe

a. Bed all foundation drains in Drainage Stone, wrapped in Mirafi 160 N geotextile filter fabric or approved equal, as shown on the drawings.

b. Shape subgrade to drain outlets as shown on the grading and drainage plan.

c. Install geotextile stabilization fabric between subgrade and pavement subbase gravel, as determined by the geotechnical engineer or Owner's Representative.

3.5 Pipe Insulation

a. Install two (2) inch thick by four (4) feet wide styrofoam SM insulation as manufactured by Dow Chemical Co., or approved equal, as shown on Detail Drawing.

b. Install over and along the sides of the pipe when there is less than four (4) feet of cover between the top of pipe and original ground grade.

SECTION 02420

SITE UTILITIES

PART 1. GENERAL

1.1 Related Documents

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Earthwork - Section 02200

c. Site Drainage - Section 02400

d. Cast-in-Place Concrete - Section 03300

e. Construction Drawings

1.2 Tests, Permits, Inspections, and Codes

a. Sewer and water lines shall be tested before use.

b. Utility installations shall comply with all applicable local and state codes and with requirements of local sewer and water districts.

c. All utility installations shall be inspected and approved by the Landscape Architect or Owner's authorized representative before being backfilled and also by utility company inspectors and local code enforcement where applicable.

d. The Contractor shall obtain and pay for any permits required for this portion of the work.

1.3 Submittals

a. Refer to Section 02400, Paragraph 1.3.

b. Product Data: Provide data on pipe materials, pipe fittings, valves, meter pit and accessories.

c. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

d. Project Record Documents: Record actual locations of piping mains, valves, connections; thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

e. All materials including pipe, valves, hydrants, etc., shall be subject to approval by the Portland Water District or designated authority.

1.4 Quality Assurance

a. Perform work in accordance with Portland Water District requirements. The Contractor shall comply with the requirements contained within this section and those contained within the Department's requirements. In the event of conflicting requirements, the more stringent standard shall apply.

1.5 Delivery, Storage and Handling

a. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of larger size. Store pipe and fittings on sills above storm drainage level and delivery for laying after trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

1.6 Damages

a. If, during the process of this work, utilities in place are damaged, they shall be restored to their proper condition at no added cost to the Owner.

PART 2. PRODUCTS

2.1 Sanitary Sewer System

a. The Contractor shall contact and coordinate with the City of Portland, Department of Public Works regarding the complete sanitary sewer system.

b. Polyvinyl Chloride (PVC) Sanitary Sewer

(1) Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification.

(2) PVC Pipe Joints: PVC shall be supplied with the coupling or coupling integrally molded to the pipe barrel. All joints shall be bell and spigot. Fittings and couplings shall be of the "O" ring push on type as required for non-pressure sewer pipe. "O" rings shall conform to ASTM Designation D 1869 - Latest revision.

(3) Fittings for PVC Sewer Pipe: Where fittings such as tee and wyes are required for service taps, "O" ring, PVC fittings shall be used. The material for the PVC fittings shall be compatible to the pipe material in characteristics.

2.2 Water Distribution System

a. The Contractor shall contact and coordinate with the Portland Water District regarding the complete water system. Refer to the Portland Water District requirements.

2.3 Thrust Blocks

a. Blocks shall be concrete of a mix not leaner than 1:2-1/2:5 cement: sand: stone, and shall have a compressive strength of not less than 3,000 psi at 28 days. Concrete for thrust blocks shall be placed against undisturbed earth.

b. Bedding: As specified in Section 02200.

c. Cover: As specified in Section 02200.

2.4 Accessories

a. Concrete for Thrust Restraints: Concrete type specified in Section 03300.

PART 3. EXECUTION

3.1 Trenches

a. Pipe trench excavation and backfill shall be as specified in Section 02200 - Site Earthwork.

3.2 Pipe Jointing and Pipe Laying: Sanitary Sewer

a. Pipe Jointing - All joints shall be made in a dry trench and in accordance with the manufacturer's recommendations and the best practices for class of pipe laid. The ends of the pipe shall be wiped clean before making the joint.

b. Pipe Laying - The pipe shall be accurately laid to the line and grades to the satisfaction of the Landscape Architect or the Owner's authorized representative. Sewer pipe shall be placed on six (6) inches of specified crushed material. The line and grade may be adjusted by the Landscape Architect or his authorized representative or a City Engineering Department representative from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore. Whenever the nature of the material excavated is such as to render it unsuitable for bedding, the Contractor shall furnish suitable material as otherwise provided in these Specifications.

c. The interior of each length of pipe shall be swabbed and wiped clean before laying the next length. No length of pipe shall be laid until the previous length has had specified material placed and tamped around it to secure it firmly in place to prevent any disturbance. Bell ends shall be laid uphill. Whenever the work is stopped temporarily for any reason whatever, the end of the pipe shall be carefully protected against dirt, water or other extraneous material.

d. The pipe shall be cut as necessary. Sufficient short lengths of pipe shall be furnished so that pipe shall not be more than four (4) feet in length at points of connection with other piping.

e. Inspection - Pipe installation shall be subject to inspection by the Landscape Architect or his authorized representative for quality, adherence to line and grade, jointing and proper backfill. Any joint not satisfactory to the Inspector shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved. All work must conform to the City of Portland standards for the sanitary installation.

f. Safety regulation of the State of Maine and the Federal Government, as applicable, shall be followed in regards to work in trenches and trench excavations.

3.3 Manhole Connection

a. Neatly cut off main flush with inside of existing manhole where they enter structure walls, and point up irregularities and rough edges with nonshrinking with nonshrinking grout. Shape inverts for smooth flow across structure floor as shown on Drawings. Use concrete and mortar to obtain proper grade and contour and finish surface with fine textured wood float.

3.4 Water Distribution System

a. Work shall be in accordance with applicable AWWA, 10 State Standards, and Portland Water District Standards.

3.5 Lines and Grades

a. All mains, valves, and curb stops locations shall be verified by the project engineer.

3.6 Excavation

a. Excavation for trenches for the placing of water mains, valves, and fittings must be of sufficient width to permit the work to be done in the manner and to the depths specified or as shown on the plans. The trench shall be dug to the required level, and the bottom shaped by hand to conform to the shape of the pipe or appurtenances being installed.

3.7 Pipe Laying

a. All pipe shall be laid to line as indicated on the Drawings. Pipes shall be laid with a minimum of 5 1/2 feet of cover over the pipe. This depth of cover shall be measured from finished grade. Pipe, fittings and valves shall be carefully handled to avoid damage.

b. Suitable equipment shall be provided by the Contractor for handling the pipe. Any damage to the pipe in handling or laying shall be at the Contractor's expense. Poured concrete thrust blocks shall be provided for all fittings shown on the Drawings and in accordance with the manufacturer's recommendations.

c. The Contractor shall install a warning tape in the water main trench that is detectable with an inductive type metal detector. The tape shall be blue and have printing that warns of a water line below. The tape shall be Allen Detectatape, as manufactured by Allen Systems, Inc., of Wheaton, Illinois or approved equal and have a 3" width.

d. Depth of installation shall be one to two feet below grade. The tape shall be detectable with an inductive type metal detector. Splicing of the tape shall be accomplished with manufacturer furnished metal clips. Where required by the Project Engineer, No. 9 gauge copper wire shall be clipped to the tape and brought to the ground surface or attached to other metal risers.

e. Unless special anchoring devices are indicated by the Project Engineer, all fittings shall be provided with concrete thrust blocks pured against the fitting and undisturbed earth to insure against disjointing from the pipe when placed under pressure. Concrete for thrust blocks shall be so placed that the pipe and joints will be accessible for repair. Concrete shall consist of one part Portland cement, 2 1/2 parts of fine aggregate, and 3 1/2 parts of course aggregate with just enough water to produce a workable consistency.

3.8 Vertical Separation From Sanitary Sewer

a. Whenever water mains must cross sewer, lay at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirements, center one full length of water main over the sewer so that both joints will be as far from the sewer as possible.

3.9 Inspection

a. The manufacturer shall certify to the Owner that all pipe and fittings furnished under this contract conform to these Specifications.

b. Acceptability of pipe shall be determined by results of strength tests and by inspection at point of delivery to determine whether pipe conforms to Specifications in design and freedom from defects. Rejection on results of field inspection may be made on account of any of the following:

(1) Variations in any dimensions exceeding permissible variations.

(2) Visible cracks, holes, foreign inclusions or other injurious defects.

(3) Any pipe or fittings showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from work.

(4) Variation of more than 1/16 inch per linear foot in alignment of pipe intended to be straight.

(5) Insecure attachment of spurs or branches.

3.10 Backfilling

a. Backfilling shall be done with approved materials free from roots, frozen pieces, rubbish, large clods or stones. Backfill materials shall be placed in trenches evenly and carefully around and over the pipe in layers. Each layer shall be thoroughly and properly compacted.

3.11 Testing

a. Whenever practical, before the trench has been backfilled or the joints covered, the pipe shall be tested for leaks. The test may also be made with one foot of backfill placed on the pipe, or the pipe may be completely backfilled. All leaks above the allowable maximum shall be repaired, however regardless of when tests are made. The Contractor shall provide all necessary equipment including but not limited to an appropriate pump, water container, pressure gauge, valve, hydrant connection and corporation stop connection, and he shall perform all work required in connection with the test.

b. Each section tested shall be slowly filled with water, care being taken to expel all air from the mains and service lines, if installed. If necessary, the pipes shall be tapped at high points to vent the air. All foreign material shall then be flushed from the main. If possible, a flushing velocity of fps shall be run through the mains until clean.

c. The portion to be tested shall be placed under constant 150 percent of working pressure or 100 psi whichever is greater as designated by the project engineer, all leaks shall be repaired, additional tests instituted and continue the process until all major leakages are eliminated. The test pressure shall be at the minimum pressure at highest point in the water line. Further, line test pressure shall not exceed 15% of the pressure rating at the lowest point.

d. Allowable maximum leakage shall be determined, as follows L=(ND/ P/7400, where L = allowable leakage in gallons per hour, N if the total length tested divided by the standard length of pipe, D is the nominal diameter of the pipe in inches and P is the test pressure specified above.

e. A complete approved pressure test of a minimum of two hour duration will be accomplished prior to disinfection. Obtaining water at the site for testing shall be the Contractor's responsibility.

3.12 Disinfection of Water Mains and Fittings

a. Disinfection of water mains and appurtenances shall be in accordance with the AWWA Standard C651-86, however, the tablet method is not allowed. Chlorinated water shall be directed along and through all lines and appurtenances to be disinfected until a minimum of fifty ppm of chlorine is detected at representative points throughout the line.

b. At the end of the 24-hour contact period, a minimum chlorine residual of 5 ppm free chlorine must be detected before disinfection will be considered successful. If unsuccessful, the lines must be re-chlorinated. Otherwise, the line shall be flushed out with clean water until a maximum of 0.4 ppm chlorine residual is detected. All valves and hydrants shall be operated several times during the twenty -four hour contact period. The disinfection water shall be wasted in an environmentally safe manner subject to the approval of the project engineer.

c. After disinfection, bacteriological samples will be collected and forwarded by the Contractor to a certified lab, such as the State Health Department, for analysis. If positive results are obtained, the system shall be repeated until negative results are obtained.

d. The method of disinfection and the chlorinating materials used shall be subject to the approval engineer.

3.13 Electric, Telephone and Cable

a. The Contractor shall coordinate and install underground utilities with Central Maine Power, Verizon, and Time Warner Cable.

b. The Contractor shall layout and do all excavating and backfilling of trenches for electric, telephone, and cable services, including foundations for light poles and transformers.

c. Contractor shall confirm all utility company requirements prior to installation, i.e., conduits.

3.14 Gas

a. The Contractor shall be responsible for the coordination of gas service to the building with Northern Utilities.

3.15 Interference

a. The Contractor shall be responsible for maintaining proper clearance between adjacent pipes and between pipes and structures. If an interference situation arises, any proposed new routing shall be approved by the Landscape Architect.

3.16 Clean-up

a. Upon completion of the installation of the sanitary sewers, appurtenant structures, water distribution system and any other work incidental thereto, the Contractor shall remove from the project all equipment, surplus construction materials and debris of any type resulting from the work and shall leave the area in as good or better condition as prior to construction.

SECTION 02460

SITE IMPROVEMENTS

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Earthwork - Section 02200.

c. Construction Drawings.

PART 2. PRODUCTS

2.1 Concrete Walks

a. All concrete shall meet the requirements as specified in Section 03300 of these Specifications.

2.2 Concrete Pavers

a. Paving stone for handicap curb ramp, entry plaza and rear patio shall be 4"x8" nominal. All 4"x 8" pavers shall be 2-3/8" thick, with average minimum compressive strength of 8,000 psi with no individual unit under 7,200 psi, and absorption rate of 5 percent, with no unit greater than 7 percent (ASTM C 140) when tested in accordance with ASTM 936-82. Paver for the handicap ramps shall be Holland Stone with a Score, color "Granite Gray". Pavers for entry plaza and rear patio shall be "Cumberland Blend" and New England Blend. All pavers as manufactured by Duracon Paving Systems, Genest Concrete - Wilson Street, P.O. Box 151, Sanford, Maine 04073 or approved equal.

2.3 Concrete Paver Joint Sealant

a. Sureland SB-1370 joint stabilizing sealer as manufactured by Sureband East, Inc.

2.4 Stone Retaining Wall

a. Stone used to build the stone walls shall be hard, durable bluestone as found at the Sawyer Street Quarry in Cape Elizabeth or approved equal. Landscape Architect shall approve samples of stone to be used prior to delivery to site for installation.

2.5 Drip Strip

a. Material for perimeter drip strip shall be Mirafi 160-N geotextile drainage fabric and ¾ inch washed stone.

2.6 Wood Fence

a. Contractor shall furnish wood fence in quantities as shown on the Drawings and as specified herein.

b. Fence shall be six (6) feet in height, white cedar fence, model "Board & Cap", as manufactured by Ron Forest & Sons Fence Co., Scarborough, Maine. All Cedar shall be Grade #1.

c. Posts shall be 5"x 5" x 10' long, Grade #1 cedar "Philly" style, as manufactured by Ron Forest & Sons Fence Co., Scarborough, Maine.

2.7 Bike Rack

a. The Contractor shall provide a ground (embedded) mountain bike rack, constructed of 2-3/8" O.D. 2" 1.D x 0.154" wall ASTM A53 schedule 40 steel pipe. Finish to powder coat "dark green". Bike rack shall be model "Heavy Duty Challenger", to accommodate 6 bicycles, as manufactured by Mardrax, 2210 Pinehurst Drive, Middleton, WI (800) 448-7931 or approved equal.

2.8 Dumpster Enclosure

a. Contractor shall furnish dumpster pad, fence and gate as shown and detailed on the Drawings and as specified herein. All fasteners shall be heavy duty and hot dipped galvanized.

2.9 Signage

a. Provide traffic control signs complying with U.S. Department of Transportation, Federal Highway Administrations Manual "Uniform Traffic Control Devices"; local codes, and as specified. See Drawings for type, location and quantity of sign required.

To be painted with reflective baked - enamel finish with following colors:

(1) "HANDICAPPED PARKING ONLY" Sign: 12" x 18" white legend on blue background. ("Van Accessible" where required)

(2) "PEDESTRIAN CROSSING" sign shall be 12"x18", black text on white background.

2.10 Concrete Bases and Footings

a. Furnish and install all concrete work in accordance with the following standards: ACI 301 Formwork, ASTM C150 Normal Type I Portland Cement, grey color, ASTM C33 fine and coarse aggregates, ASTM C94 concrete mix, comprehensive strength of 4000 PSI at 28 days. Deformed welded wire fabric ANSI/ASTM A497, rebar; ASTM A613 grade 60.

2.11 Pavement Markings

a. The paint shall be a non-bleeding, quick drying, alkyd petroleum base paint suitable for traffic-bearing surfaces and shall meet FS TTP-85E and mixed in accordance with manufacturer's instructions before application.

PART 3. EXECUTION

3.1 Concrete Walks

a. After placement of the gravel base, the surface shall be brought to a smooth, uniform surface by grading and rolling the crushed aggregate base and re-rolled until the surface is true and even.

b. Slabs shall be placed alternately in lengths not to exceed 30 feet, or as directed and shall be separated by an expansion joint of preformed expansion joint filler and sealant 1/3 inch in thickness. The thickness of the slab shall be as shown on the Plans. The sidewalk surface shall be scored 1-3/8 inch deep into block units as shown on the Plans. When a concrete sidewalk is constructed adjacent to a building, fixed or other structures, a 1/2 inch thick preformed joint filler and sealant shall be used between the slab and the structure. Both expansion and control joints are to occur only within score joints.

c. Broom Finish - Broom finish by drawing a stiff-bristled pushbroom with a long handle over a troweled surface. Concrete walks shall receive a medium broom finish. Direction of brooming shall be perpendicular to major direction of pedestrian movement or as directed by the Landscape Architect.

d. Concrete pavement shall be saw cut (not tooled) after brooming to insure a well-defined and smooth border.

e. Finished concrete shall be properly cured using a waterproof material, such as Sisal Kraft orange label lapped 6 inch taped. The concrete shall be properly moistened before covering it, and shall be kept tight. Curing shall be a minimum of seven (7) days.

3.2 Concrete Pavers

a. Base shall be fine graded and compacted to 4-1/2 inches below desired finished grade. The concrete sand setting bed shall be screened loose to a thickness of 1-1/2 inches. After sand has been screened, it shall not be disturbed or pre-compacted.

b. Pavers shall be laid in a running bond pattern or as indicated on the Drawings, hand tight with care taken to maintain straight and true lines as shown on the Drawings. All necessary cutting shall be accomplished with a masonry saw.

c. Compaction: After pavers are installed and the cutting has been completed, the stones shall be compacted into the loose sand with a plate type vibrating compactor, two (2) passes on all areas. Sand shall then be swept into the joints and vibrated with a plate type compactor until joints are full. Joints shall be filled all the way to the bottom of the chamfer on the pavers. Excess sand shall be swept off and removed from the site.

d. Surface tolerance: Upon completion of a section of pavers, the surface of the pavers shall be checked with a ten (10) foot straight edge. Variation exceeding 1/8 inch between adjacent stones shall be corrected by relaying.

e. Thoroughly clean all exposed surfaces with a solution of detergent and water, using still-fiber brushed.

3.3 Paver Sealant

a. Pavers and joints shall be sealed with approved sealer, per manufacturer's requirements.

3.4 Stone Retaining Wall

a. Stone retaining wall shall be installed by skilled workmen thoroughly trained with a minimum of eight years experience with this type of work and under proper supervision.

b. Construct stone wall to the lines and grades shown on the Drawings and as detailed. Excavate to stable ground. Place larger stones at the bottom of wall, building up using Portland Cement mortar to bed all inside joints. All exposed joints shall be cleaned such that no mortar is visible. The spaces between the larger stones shall be filled with smaller stones in such a manner that both faces shall become a compact mass of stone. Cap stones shall be jointed and filled with mortar.

3.5 Drip-Strip

a. The Contractor shall excavate to limits shown on the Drawings. Compact subgrade to provide a firm even base. Place 3/4" washed stone in six (6) inch layers and compact to achieve depth required on the Drawings.

3.6 Wood Fence

a. Contractor shall place and install fence in locations as shown on the Drawings. Fence posts shall be installed and set into compacted subgrade and backfilled with gravel.

b. Fence panels shall be attached to posts as recommended by manufacturer. Furnish and install hinges, latches, and wheels on each gate and one can bolt on one cane bolt on one gate.

3.7 Bike Rack

a. Contractor shall install bike rack as shown on Drawings in accordance with manufacturer's requirements. Protect finish surface of bike during delivery, installation and placement of concrete pad.

3.8 Dumpster Enclosure

a. Contractor shall construct and install dumpster enclosure in location and as detailed on the Drawings and as specified herein.

3.9 Signage

a. Contractor shall install signs in locations and as detailed on the Drawings. Set posts vertical and plumb. Mount sign in accordance with manufacturer's instructions.

3.10 Concrete Pads, Bases and Footings

a. Contractor shall supply and install concrete pads, bases and footings in quantities and locations as shown on the Drawings and specified herein.

3.11 Pavement Markings

a. Immediately before applying the pavement marking paint to the pavement, the surface shall be dry and entirely free from dirt, grease, oil or other foreign matter which would reduce the bond between the paint and the pavement. The surface shall be thoroughly cleaned by sweeping and blowing, if required, to remove all dust, dirt and loose materials. Areas which cannot be satisfactorily cleaned by sweeping and blowing shall be scrubbed with water, as directed, after which the surface shall be allowed to dry prior to painting.

b. Apply two (2) coats of paint at manufacturer's recommended rate without the addition of thinner with a maximum of 125 square feet per gallon. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use a straightedge to ensure a uniform, clean, and straight stripe.

SECTION 02470

BITUMINOUS CONCRETE PAVING

PART 1. GENERAL

1.1. Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Earthwork - Section 02200.

c. Construction Drawings.

1.2 References

a. State of Maine Deparment of Transportation Standard Specifications Higways and Bridges, latest revision, hereafter designated as MDOT Specifications.

1.3 Material Certificates

a. Submit materials certificate to onsite independent testing laboratory which is signed by material producer and Contractor, certifying that materials comply with, or exceed, the requirements herein.

PART 2. PRODUCTS

2.1 Materials

a. Bituminous Concrete (roadway and parking) - An approved hot plant mix conforming to MDOT Standard Specifications (latest revision). Use Grading B mix for binder and C mix for surface.

PART 3. EXECUTION

3.1 Bituminous Concrete Paving

a. The Contractor shall be responsible that gravel is in proper condition to pave before starting work.

b. Proof roll prepared base material surface to check for areas requiring additional compaction and areas requiring removal and recompaction.

c. Do not begin paving work until deficient base material areas have been corrected and are ready to receive paving.

d. Pavement mix for roads and parking areas shall be as herein specified and shall consist of the following courses after compaction:

	Binder Course	Wearing Course
Standard Duty Pavement:	2"	1"

e. The spreading of bituminous concrete shall be done wherever practicable by an approved mechanical spreader. Place mixture while it is still hot (+250 D.F.). Rolling shall be done as soon as practicable after spreading and in no case after the mixture is cooled. The exposed finished surface shall present a true, smooth plane, free from roller marks, conspicuous joining lines, patches, voids or other imperfections. Where brown spots or other serious imperfections occur they shall be cut down to the base course and replaced by new pavement rather than by attempting to patch the surface. Feathered edge patches will not be permitted.

f. Apply successive lifts of asphaltic concrete in transverse directions with the surface course placed in the direction of surface-water flow. Place in typical strips not less than 10' - 0" wide.

g. Make joints between old and new pavements or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Joints at existing street paving and new paving shall be saw cut. Clean contact surfaces and apply tack coat.

h. Mix placed by hand shall be placed on a steel dump board or wheelbarrow from the truck and then shoveled into place.

3.2 Rolling and Compaction

a. The mixture, after being spread, shall be thoroughly compacted by rolling as soon as it will bear the weight of the rollers without undue displacement. Mixture shall be compacted to a minimum of 92% theoretical maximum density. The number, weight and types of rollers and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in workable condition.

b. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

c. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

d. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

e. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

f. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

g. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

h. Do not permit manuvering of excavating equipment, lifts or other vehicles with tight turning or tracking capabilities on finished surface. Damaged areas shall be restored by Contractor at no additional expense to Owner.

3.3 Field Quality Control

a. Grade Control: Establish and maintain required lines and elevations.

b. Thickness: In-place compacted thickness shall not be less than thickness specified on the Drawings. Areas of deficient paving thickness shall receive a tack coat and a minimum one (1) inch overlay; or shall be removed and replaced to the proper thickness, at the discretion of the Owner; until specified thickness of the course is met or exceeded at no additional expense to the Owner.

c. Surface Smoothness: Testing shall be performed on the finished surface of each asphalt concrete course for smoothness, using 10' - 0"

straightedge applied parallel with, and at right angles to centerline of paved area.

The results of these tests shall be made available to the Owner upon request. Surfaces will not be acceptable if exceeding following tolerances for smoothness:

Base Course Surface:	1/4"
Wearing Course Surface:	3/16"

d. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable paving as directed by Owner.

e. Compaction: Field density tests for in-place materials shall be performed by examination of field cores in accordance with one of the following standards:

   (1) Bulk specific gravity of paraffin-coated specimens: ASTM D-1188.
   (2) Bulk specific gravity using saturated surface-dry specimens: ASTM D-2726.

f. Rate of testing shall be one (1) core per 20,000 square feet of pavement, with a minimum of three (3) cores from heavy-duty areas and three (3) cores from standard-duty areas. Cores shall be cut from areas representative of the project.

g. Areas of insufficient compaction shall be delineated, removed and replaced in compliance with the specifications at no expense to the Owner. Areas damaged by construction equipment shall be repaired to satisfaction of Owner at no expense to Owner.

SECTION 02480

CURBING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Earthwork - Section 02200

c. Construction Drawings

1.2 References

a. Where M.D.O.T. appears it shall be taken to mean The State of Maine Department of Transportation Specifications, Highways and Bridges - Latest Revision.

PART 2. PRODUCTS

2.1 Materials

a. Vertical Granite Curb: Vertical granite curb shall conform to M.D.O.T. specifications for TYPE I. Curb shall be acceptable granite from approved quarries.

b. Sloped Granite Curb: Sloped granite curb shall conform to M.D.O.T. specifications for Type V.

c. Tip-Down and Transition Granite Curb: Miscellaneous granite curb sections shall conform to M.D.O.T. Specifications 712.04 (b).

d. All granite curb shall conform to the following standards:

(1) All granite curb shall be basically light gray in color, free from seams and other structural imperfection or flaws which would impair its structural integrity, and of a smooth splitting appearance. Natural color variation characteristic of the deposit from which the curbing is obtained will be permitted.

(2) The exposed face shall be smooth quarry split to an approximately true plane having no projections or depressions which will cause over one (1) inch to show between a two (2) foot straight-edge and the face when the straight-edge is placed as closely as possible on any part of the face.

(3) If projections on the face are more than that specified they shall be dressed off. The top and bottom lines of the face shall be pitched off to a straight line and shall not show over one (1) inch between stone and straight-edge when straight-edge is placed along the entire length of the top and bottom lines and when viewed from a direction at right angles to the plane of the face, and for the top line only not over (1) inch when viewed from a direction in the plane of the face. The ends shall be square to the length at the face and so cut that when placed end to end as closely as possible, no space shall show in the joint at the face of over 3/8 inch, except that where the edging is to be used on a curve having a radius of ten (10) feet or less, the ends of the stones shall be so cut as to provide a finished joint at the face section of not more than 1/2 inch. The arras formed by the intersection of the plane of the face with the plane of the end joint shall not vary from the plane of the face more than 1/4 inch. Drill holes not more than 3-1/2 inches in length and 1/2 inch in depth will be permitted. The sides shall not be broken under the square more than four (4) inches and the side adjacent to the grass shall not project over one (1) inch.

(4) Dimension Tolerance:

Minimum Length	2 feet
Maximum Length	8 feet
Thickness	4 inches
Width of Face	12 inches

(5) Acceptable Manufacturer:
John Swenson Granite Co. or approved equal.

PART 3. EXECUTION

3.1 Granite Curb

a. Contractor shall install, backfill and protect all granite curb in accordance with M.D.O.T. Subsection 609.03 and as detailed on the Drawings. Provide approved granite tip-down curbs at all curb end sections and handicapped ramps. Provide approved granite transition curb where curb type and or material changes occur.

3.2 Protection

a. The Contractor shall provide temporary barriers to protect newly formed bituminous curbing from damage during construction. All damaged curbing shall be repaired or replaced as necessary without additional expense to owner and inspected and approved by the Owner's Representative.

b. The Contractor shall be responsible to protect and repair as necessary all vertical, sloped granite or concrete curbing disturbed during construction and no expense to owner. Provide temporary barriers at all radius locations where truck entry would impact curbing.

SECTION 02500

LANDSCAPING

PART 1. GENERAL

1.1 Related Work Specified Elsewhere

a. The general provisions and documents of the Contract, including General and Special Conditions, apply to the work specified in this Section.

b. Site Improvements - Section 02870

c. Construction Drawings

1.2 Scope

a. Work under this Section shall include all labor, materials, services, equipment and accessories necessary to furnish and install trees, shrubs, and turf in accordance with the specifications and applicable Drawings.

1.3 Certification of Acceptability

a. Inspection of the work covered by this Section to determine completion of the work involved will be made at the conclusion of the Maintenance Period upon written notice requesting such inspection submitted by the Landscape Contractor at least ten (10) days prior to the anticipated date. The condition of turf and plantings will be noted and determination made by the Landscape Architect whether maintenance shall continue.

1.4 Standards

a. Provide plants which are true to name. Tag one of each bundle or Lot with the name and size of plants and shall conform to ANSI Z260.1 - Nursery Stock, latest edition, of the American Association of Nurserymen, Inc.

b. Workmanship: Perform work in accordance with the best standards of practice for Landscape work and under the continual supervision of a competent foreman capable of interpreting the Drawings and Specifications.

c. Submit documentation to Landscape Architect of Record within twenty-five (25) days after award of contract stating that plant material is available. Any and all substitutions due to unavailability must be requested in writing prior to confirmation of ordering.

d. Plants shall be subject to review and approval of Landscape Architect of Record at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of review and rejections during progress of the work. Submit written request for review of plant material at place of growth to Landscape Architect of Record. Written request shall state the place of growth and quantity of plants to be reviewed. Landscape Architect of Record reserves the right to refuse review at this time if, in his judgement, sufficient quantity of plants is not available for review. Review shall be for character and form.

1.5 Guarantee

e. Turf and plantings shall be guaranteed for one (1) full year after certification of acceptability by the Landscape Architect and shall be alive and in satisfactory growth at the end of the guarantee period, except for damage resulting from causes beyond the responsibility of the Contractor. The Contractor shall provide the Owner with a written guarantee upon certification of acceptability. For plant material in question at the end of the guarantee, the Landscape Architect, Owner and Contractor shall determine a reasonable extension of the guarantee period.

1.6 Tests and Certifications

a. Tests specified in this Section shall be paid for by the Contractor. **Certifications required must be submitted to the Landscape Architect or Owner's Representative for approval before use of materials on the site.**

b. **The Contractor shall be required to take representative soil samples of the topsoil** to be provided from several locations (on-site) in the area(s) under consideration for testing. Imported topsoil shall also require test results prior to placement. Tests shall be made by a State Commercial Soil Testing Laboratory using methods approved by the Association of Official Agricultural Chemist or the State Agricultural Experiment Station, or by the University of Maine at Orono. Testing shall include chemical balance (pH) **as well as organic content.** The required pH level shall be between 6.6-7.3% and the organic content shall be between 6.5-8%.

c. The Contractor shall provide testing data for composted soil amendment if required to supplement the required minimum organic content.

PART 2. PRODUCTS

2.1 Materials

a. Topsoil - The Contractor shall furnish and place topsoil to give the specified depths. The Contractor shall furnish and place 18 inches of loam in all shrub beds, and 6 inches under all turf areas. Topsoil mix shall be placed in all tree and shrub pits as shown on the Drawings. Natural loam topsoil shall be of uniform quality, free from hard clods, still clay, hard pan sods, stones over ¾ inches and undesirable inorganic materials. The Owner and/or Landscape Architect reserves the right to reject on or after delivery any materials which do not, in his or her opinion, meet these Specifications.

b. Additives

(1) Humus - Ground or shredded peat that has been stockpiled at least one year prior to use, or commercial bagged peat.

(2) Manure - Well-rotted unleached stable manure with no more that 25% straw, shavings, or sawdust content. A mixture of one (1) cubic yard of peat humus or peat moss and 100 lbs. of commercial dehydrated-bagged manure such as Bovung or Spurigon may be used.

(3) Mulch for Plants - Well-rotted **(black)** shredded pine bark as approved by the Landscape Architect.

(4) Lime - Commercial ground lime with no less than 85% total carbonates, 50% passing a 100 mesh sieve and 90% passing a 200 mesh sieve as approved by the Landscape Architect. Coarser material will be accepted provided that specific rates of application increased proportionately.

(5) Compost soil amendment – Acceptable compost for "compost manufactured topsoil" shall conform to EPA Chapter 40 CFR 503 (pathogen, metals and vector attraction reduction) as well as applicable state regulations.

c. Commercial Fertilizer

(1) Seeding - 19-26-5 dust free homogenous granular material such as Scotts Pro-Turf Starter Fertilizer or an approved equal (application rate as recommended by manufacturer).

(2) Sodding - 10-6-4 with 50% nitrogen derived from ureaform, such as Agway Turfwood Special Premium or an approved equal (application rate as recommended by manufacturer).

(3) Superphosphate - 0-20-0 in unopened bags with manufacturer analysis printed on the bag.

d. Plant Materials - Furnish plants shown and specified on the Drawings and listed in the plant materials list. Discrepancies between the number of plants shown on the Drawings and the number listed in the plant list shall not be grounds for additional renumeration for the Contractor. Plants shall be nursery grown, typical of their species or variety and have a normal habit of growth. Any plant with broken, damaged, or badly bruised branches, trunks, or root balls shall be rejected.

(1) Sizes: Plants larger than specified in the plant list may be used if approved by the Landscape Architect but use of such plants shall not increase the contract price. If the use of the larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plants.

(2) Substitutions: In the event that trees, shrubs or other plant material specified in the plant list are impossible or unreasonably difficult to obtain, the Contractor shall immediately notify the Landscape Architect to discuss appropriate substitutions. No substitutions of plant material may be made without the approval of the Landscape Architect.

e. Grass Seed

(1) Grass Seed mixtures shall be fresh, clean, new crop seed. Seed may be mixed by an approved method on the site, or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed statement of the composition of the mixture and the percentage of purity of each variety. The Dealer's Guarantee Statement shall be delivered to the Landscape Architect.

(2) Grass seed mixture shall be of the following types of seed:

- Lawn Areas:

  Park Mix by Allen, Sterling & Lothrop or approved equal

  35% Kentucky Bluegrass 85/80
  20% Creeping Red Fescue
  15% Chewings Fescue
  15% Perennial Ryegrass
  15% Ryegrass

f. Sod - Sod shall be well-established turf of even thickness consisting of a Bluegrass blend, 90% Bluegrass and 10% Fescue. Sod shall be as provided by Winding Brook Sod Farm, Lyman, Maine or approved equal.

PART 3. EXECUTION

3.1 Pre-Plant Wee Control

a. If live perennial weeds exist on site at the beginning of work, spray with a non-selective systemic contact herbicide, as recommended and applied by an approved licensed landscape pest control advisor and applicator. Leave sprayed plants intact for at least fifteen days to allow systemic kill or as directed by advisor.

b. Maintain site weed free until final acceptance by Owner utilizing mechanical, manual and/or chemical treatment.

3.2 Planting of Trees and Shrubs

a. Plants must be located by the Contractor and approved by the Landscape Architect before pits are dug. The Contractor shall notify the Landscape Architect at least 48 hours prior to scheduling installation of plant material. Locations as shown on the Drawings may be varied due to existing conditions.

b. Preparation of Soil - Manure, peat humus and superphosphate additives shall be incorporated into topsoil by placing the additives over topsoil piles and turning piles at least 3 times or until thoroughly mixed. (Refer to planting detail)

3.3 Staking and Guying

a. Trees shall be staked at the time of planting as shown on the typical section of Tree Planting Detail.

3.4 Pruning and Mulching

a. Remove all dead wood and/or suckers and all broken or badly bruised branches. All pruning shall conform to standards established by the National Arborist Association.

b. Immediately after planting operations are completed, cover all tree and shrub pits with three (3) inch layer of specified mulch. The limit of this mulch for trees shall be the area of the pit and for shrubs in beds, the entire area of the shrub bed.

3.5 Watering

a. The Contractor shall be responsible for thoroughly watering all plant material upon installation.

b. Watering shall be monitored on a daily basis when temperatures exceed 70 degrees. The depth of moisture in all tree and shrub plantings shall be adequate to prevent wilting.

c. Watering (as required) of plant material shall continue for the duration of the maintenance period until certification of acceptability.

3.6 Loaming and Seeding

a. Conduct planting operations under favorable weather conditions. Areas not required to be developed otherwise shall be seeded to turf.

b. Compost Manufactured Topsoil – The soil (source material) shall be free of lumps, plants, weeds, roots and other debris over 2 inches in any dimension and free of stones over inch in any dimension. The organic compost shall be uniformly incorporated into the loam source by rolling and tumbling, by a front-end loader or by processing in a mixing plant. The material shall be mixed sufficiently to produce a homogenous soil, free of lumps and clods. In addition to the requirements for the compost amendment, the Contractor shall provide documentation that the recommended rate of fertilizer, per the testing analysis, has been applied to lawn areas prior to seeding.

c. Prior to placing loam, scarify subgrade areas; remove all rocks over two (2) inches and debris; and set grade stakes as necessary. Place topsoil evenly over all areas to be loamed to a minimum thickness of six (6) inches. Hand rake to remove clods, lumps, brush, roots, and stones over ¾ inch in diameter. Hand roll to show depressions and uneven grades. Regrade as necessary to obtain smooth, even grades. Surplus topsoil shall become the property of the Contractor and shall be removed off the site.

d. Apply additives (lime, fertilizer, compost etc.) as per the recommendation of the testing lab. Apply additives and harrow into top two (2) inches of the seedbed.

e. Sow seed specified by use of a mechanical spreader at the rates specified. Rake lightly in; roll with 200 lb. roller and water with a fine spray.

f. Following compaction, apply a one- (1) inch layer of straw to hasten germination.

g. Full even growth in all areas must be guaranteed. The maintenance period shall continue after seeding and until the lawns are certified acceptable by the Landscape Architect.

h. Repair damage resulting from erosion, gullies, washouts or other similar causes if such damage occurs before certification of acceptability of turf and planting by the Landscape Architect.

i. Sod - After all grading has been completed, the soil shall be irrigated within 12-24 hours before laying the sod. Sod shall not be laid on soil that is dry and powdery.

j. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote a uniform growth and strength. Care shall be exercised to insure that the sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which cause air drying of the roots.

k. The Contractor shall water sod immediately after installation to prevent drying during progress of the work. It shall then be thoroughly irrigated to a depth sufficient that the underside of the new sod pad and soil immediately below the sod is thoroughly wet.

l. Rolling of the sod shall be required to properly join sod to the bed after the sod is installed and twenty-four (24) to forty-eight (48) hours after initial watering. The Contractor shall roll the required area with a roller which weights seventy-five (75) to one hundred (100) pounds per square foot of roller width. The completed sod surface shall be true to finish grades as shown on plans and even and firm at all points.

m. Watering

(1) First and Second Week - The Contractor shall provide all labor and arrange for all watering necessary for establishment of the turf. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first and second week and in sufficient quantities to maintain moist soil to a depth of at least four (4) inches. Watering should be done during the heat of the day to help prevent wilting.

(2) Watering shall continue to be the responsibility of the Contractor until such time as the Owner or project Landscape Architect has certified acceptance of lawn areas.

Maintenance

a. General - Maintenance shall begin immediately after each portion of seed and each plant is planted and shall continue in accordance with the following:

(1) Lawns: The Contractor shall be responsible for establishing a uniform stand of the specified seed and until a Certification of Acceptability is received. No bare spots shall be allowed. After the seed has started, all areas and parts of areas that fail to show a uniform stand of grass, for any reason whatsoever, shall be seeded or sodded repeatedly until all areas are covered with a satisfactory growth of grass. The Contractor shall be responsible for the first two (2) mowings.

(2) New Plantings: Protect and maintain new planting until the end of the lawn maintenance period, or, if installed after the lawn maintenance period, until installation of planting is certified acceptable by the Landscape Architect. Maintenance shall include watering, spraying and dusting for insect and fungal control, mulching, tightening and repairing guys, replacement of sick or dead plants, resetting plants to proper grades or upright position, and restoration of planting saucer, and all other care needed for proper growth and maintenance of the plants. Planting completed after the lawn preparation shall provide proper protection to lawn areas. Any damage resulting from planting operations shall be promptly repaired.

(3) Spraying and Dusting: During the maintenance and guarantee periods, the Contractor shall do all seasonal spraying and/or dusting of trees and shrubs as required.

(4) Protection: Planting areas and plants shall be protected against trespassing and damage of any kind. If any plants become damaged or injuries occur, they shall be treated or replaced as directed.

(5) Damage: Damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, tamping, re-fertilizing, and sodding by the Contractor at his own expense if such damage occurs prior to certification of acceptability of turf and plantings by the Landscape Architect.

(6) Responsibility: The Contractor's responsibility for maintenance shall cease at the time of certification of acceptability by the Landscape Architect. During the guarantee period, the Contractor shall be held responsible for making replacements, but no maintenance shall be required, other than spraying and dusting.

3.7 Replacement

a. At the end of the guarantee period, inspection will be made by the Landscape Architect upon written notice requesting such inspection submitted by the Contractor at least ten (10) days before the anticipated date. Any plant required under this Contract that is dead or not in satisfactory condition, as determined by the Landscape Architect, shall be removed from the site. These, and any other plants missing due to the negligence of the Contractor, shall be replaced with plants of the same type and size as originally specified. Replanting shall be done as soon as conditions permit, but during the normal planting season. Plant items in accordance with these specifications.

3.8 Clean-up

a. The Landscape Contractor shall remove all debris, construction equipment, excess fill, rocks, and other excess material caused by his work, from the site upon completion of his portion of the work.

END OF SECTION

SECTION 02905

LANDSCAPING

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections, apply to Work of this section.

1.2 SECTION INCLUDES

A. Preparation of soil, placement of plant life, seed, sod, and fertilizer.

1.3 QUALITY CONTROL

A. Nursery: Company specializing in growing and cultivating the plant life specified in this Section.

B. Sod Producer: Company specializing in sod production and harvesting and certified by the State of NH.

C. Plant Materials: Comply with recommendations of ANSI Z60.1.

D. Maintenance Services: Performed by installer.

1.4 WARRANTY

A. Provide one year warranty including one continuous growing season under provisions of Section 01001 including coverage of plants from death or unhealthy conditions.

B. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty beginning on date of replacement.

1.5 MAINTENANCE SERVICE

A. Maintain seeded areas or sodded areas and plant life immediately after placement until grass and plants are well established and exhibit a vigorous growing condition for two cuttings.

2 PART 2 PRODUCTS

2.1 GRASS

A. Seed Mixture:

1. Kentucky Blue Grass: 50 percent.
2. Creeping Red Fescue Grass: 40 percent.

3. Perennial Rye: 10 percent.

B. Sod: ASPA Certified Nursery grown; cultivated grass sod; with strong fibrous root system.

C. Machine cut sod with minimum 1/2 inch and maximum 1 inch topsoil base.

2.2 TREES, PLANTS, AND GROUND COVER

A. Trees Plants and Ground Cover: Species and size identified in Plant as indicated on Drawings, grown in climatic conditions similar to those in locality of the Work.

B. Provide balled and burlapped trees and shrubs.

2.3 SOIL AND SOIL MODIFICATION MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, free of subsoil, clay or impurities, plants, weeds and roots.

B. Fertilizer: Fifty percent of the elements derived from organic sources, to the following proportions: Nitrogen 5 percent, phosphoric acid 10 percent, soluble potash 5 percent.

2.4 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

B. Mesh: Interwoven biodegradable fiber.

C. Edging: Decay resistant wood, treated softwood or redwood.

D. Drip Strip Stone: Washed natural stone, ¾" to 1-1/2" size.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that required underground utilities are in proper location.

B. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas. Remove stones over 1-1/2" in any dimension. Remove sticks, roots, rubbish and other extraneous matter.

C. Scarify subsoil to a depth of 3 inches.

3.2 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches compacted thickness. Rake smooth.

B. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

C. Place topsoil into pits and beds intended for plant root balls to a minimum thickness of 6 inches.

D. Apply fertilizer in accordance with manufacturer's instructions.

3.3 SEEDING

A. Apply seed or Hydroseed with a seed slurry at a rate of 4 lb per 1000 sq ft evenly in two intersecting directions.

B. Immediately following seeding, apply agricultural mulch to a loose thickness of 1-1/2 inches.

C. Apply water with a fine spray immediately after each area has been mulched.

3.4 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately on delivery to site within 24 hours after harvesting; with tight staggered joints.

C. On slopes 1:2 and steeper, place mesh over topsoil, lay sod perpendicular to slope and secure every row with wooden pegs.

D. Water sodded areas immediately after placement.

3.5 PLANTING

A. Set plants in pits or beds partly filled with prepared topsoil mixture. Backfill with topsoil mixture.

B. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

C. Stake and guy trees immediately after planting.

D. Mulch trees and shrubs with 3” minimum thickness of bark mulch.

E. Apply anti-dessicant agent to plantings.

F. Prune trees and shrubs in accordance with horticultural practice.

3.6 MAINTENANCE

A. Mow grass at regular intervals to maintain maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Water to prevent grass and soil from drying out.

C. Control growth of weeds. Apply herbicides and/or pesticides in accordance with manufacturer's instructions.

…END OF SECTION

Part II
Division 3

Concrete

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Related Documents: Drawings and general provisions of Contract.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Work included:

Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:

1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.

2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.

1.03 RELATED WORK:

A. Miscellaneous Metal: Section 05500

1. Expansion Anchors - Section 05500

2. Embedded Items - Section 05500

B. Anchor Bolts: Section 05120

C. Joint Sealants: Section 07900

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following except where more stringent requirements are shown or specified:

1. ACI 213R-Latest Edition "Guide for Structural Lightweight Aggregate Concrete."

2. ACI 211.1-Latest Edition "Recommended Practice for Selecting Proportions for Normal Heavyweight and Mass Concrete."

3. ACI 212.2 Latest Edition "Guide for Use of Admixtures in Concrete."

4. ACI 301-Latest Edition "Specifications for Structural Concrete for Buildings."

5. ACI 302.1 Latest Edition "Guide for Concrete Floor and Slab Construction."

6. ACI 304-Latest Edition "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."

7. ACI 304-2 Latest Edition "Placing Concrete by Pumping Methods."

8. ACI 306 Latest Edition "Cold Weather Concreting."

9. ACI 308-Latest Edition "Standard Practice for Curing Concrete."

10. ACI 309-Latest Edition "Recommended Practice for Consolidation of Concrete."

11. ACI 315-Latest Edition "Details and Detailing of Concrete Reinforcement."

12. ACI 318-Latest Edition "Building Code Requirements for Reinforced Concrete."

13. ACI 347-Latest Edition "Recommended Practice for Concrete Formwork."

14. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars," 1976.

15. ACI 211.2-Latest Edition "Standard Practice for Selecting Proportions for Structural Lightweight Concrete."

B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated shall be done at Owner's expense. Retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, polypropylene fiber admixtures, patching compounds, non-shrink grout, water stops, joint systems, curing compounds, and others as requested by Architect.

B. Shop Drawings:

1. Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test if trial batch method is used for proportioning concrete mixes.

E. Strength Tests: Provide required records of strength tests if field experience method is used for proportioning concrete mixes.

PART 2 - PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number

of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Fiber Reinforcing: ASTM C1116, Type III virgin polypropylene fibers as manufactured by FIBERMESH.

1. The Fiber size (length) required shall be based on the largest size of the coarse aggregate in the concrete mix and determined by the manufacturer. Manufacturer shall submit written confirmation as to size of fibers which will be used based on concrete mix specified.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.

D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendation, unless otherwise specified. Wood, brick and other devices are not acceptable.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type I or Type II, unless otherwise acceptable to Architect. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.

C. Light Weight Aggregates: ASTM C 330.

D. Water: Potable.

E. Air-Entraining Admixture: ASTM C 260.

F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.

1. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.

G. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.

H. Accelerating Admixture: ASTM C 494, Type C or E.

I. Calcium Chloride not permitted.

2.04 RELATED MATERIALS:

A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:

1. Reinforced Polyethylene sheet not less than 6 mils thick.

B. Non-Shrink Cement-based Grout: Provide grout consisting of premeasured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.

1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.

3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.

4. Composition: Shall not contain metallic particles or expansive cement.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.

1. Waterproof paper.

2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound:

1. Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Curing compound shall not impair bonding of any material to be applied directly to the concrete. Demonstrate the non-impairment prior to use.

F. Preformed Expansion Joint Formers:

1. Bituminous Fiber Type, ASTM D 1751.

2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.

G. Slab Joint Filler:

1. Multi-component polyurethane sealant (self-leveling type).

H. WaterStop: Duroseal Gasket Waterstop & Duroseal paste by AWS (Absolute Waterproofing Systems, Inc.). Install per manufacturers printed instructions where required.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 14 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Interior Elevated Slab: N/A
   a. Strength: 3000 psi @28 days, 3/4" aggr.
   b. W/C Ratio: 0.46
   c. Entrained Air: 4% $\pm$ 1%
   d. Slump: 3" $\pm$ 1"

2. Interior Slabs-on-grade & retaining walls
   a. Strength: 4000 psi @28 days, 3/8" aggr.
   b. W/C Ratio: 0.44
   c. Entrained Air: 4% $\pm$ 1%
   d. Slump: 3" $\pm$ 1"

3. Footings, Frost Walls & Piers.
   a. Strength: 3000 psi @ 28 days, 3/4" aggr.

b. W/C Ratio: 0.46
c. Entrained Air: 4% ± 1%
d. Slump: 3" ± 1"

4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.
   a. 4% to 8% for maximum 3/4" aggregate.
   b. 6% to 10% for maximum 3/8" aggregate.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.

1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.

2. 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.

2.06 CONCRETE MIXING:

A. Job-Site Mixing: Will not be permitted.

B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.

1. 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 by Engineer.
2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.

C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustication's, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

H. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

   1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT:

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

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

2. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

3. Place reinforcement to obtain specified coverages for concrete protection within tolerances of ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

4. Fiber Reinforcing shall be introduced directly into the concrete either at the batch plant or job site at the rate of 1.6 pounds (minimum) per cubic yard. If introduced at the batch plant with the aggregate, no extra mixing time is required. If added at the job site, approximately 3 to 5 minutes mixing at agitating speed is required.

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

3.03 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; accepted bulkheads designed for this purpose may be used for slabs.
2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.
3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required or permitted, cutting shall be timed properly with the set of the concrete: Cutting shall be started as soon as the concrete has been hardened sufficiently to prevent aggregate being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

3.04 INSTALLATION OF EMBEDDED ITEMS:

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

3.05 INSTALLATION OF GROUT

A. Place grout for base plates in accordance with manufacturer's recommendations.

B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.

C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES:

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

A. Preplacement Review: Footing bottoms, reinforcement and all work shall be subject to review by the Architect. Verify that reinforcing, ducts, anchors, seats, plates and other items to be cast into concrete are placed and securely held. Notify Architect 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Moisten wood forms immediately before placing concrete where form coatings are not used. Be sure that all debris and other foreign matter is removed from forms.

B. General: Comply with ACI 304, and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as

nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:

   a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.

   b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.

   c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

   d. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.

   e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.

4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

   1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, redoing or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

   2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

   1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

   2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.

   3. Maintain reinforcing in proper position during concrete placement operations.

E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C), and not more than 80 deg.F (27 deg.C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be provided prior to start of placing operations.

5. When the air temperature has fallen to or is expected to fall below 40 deg.F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 deg.F.

F. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg.F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.

Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

Wet forms thoroughly before placing concrete.

Do not use retarding admixtures without the written acceptance of the Architect.

3.08 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.

   Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent uniformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES:

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.

   1. After placing slabs, plane surface to a tolerance not exceeding 1/2 in. in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.

   1. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10 ft. straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.

   1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10-ft. straightedge. Grind smooth any surface defects which would telegraph through applied floor covering system.

D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

   1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to

main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 as herein specified.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

a. Curing shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength, f'c. If one of the curing procedures below is used initially, it may be replaced by one of the other procedures any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

3. When the mean daily temperature is less than 40 deg.F, the temperature of the concrete shall be maintained between 50 and 70 deg.F for the required curing period.

a. When necessary, arrangements for heating, covering, insulation, or housing the concrete work shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

b. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.

c. Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5 deg.F in any 1 hour or 50 deg.F in any 24 hour period.

B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-in. lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:

a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 in. and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing compound to slabs as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain

continuity of coating and repair damage during curing period.

c. Separating compound may be used as a curing medium if applied in accordance with manufacturer's specifications.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Protection From Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.11 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg.F (10 deg.C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.12 REUSE OF FORMS:

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.14 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock

pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Proprietary patching compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

6. Use epoxy-based mortar for structural repairs, where directed by the Architect.

7. Repair methods not specified above may be used, subject to acceptance of the Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Contractor shall employ a testing laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board.

B. Concrete shall be sampled and tested for quality control during placement of concrete shall include the following, unless otherwise directed by Architect.

C. Sampling Fresh Concrete: ASTM C 172.

1. Slump: ASTM C 143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544.

2. Air Content: ASTM C 231 "Pressure method for normal weight concrete." One for each set of compressive strength test specimens.

3. Concrete Temperature: Test hourly when air temperature is 40 deg.F (4 deg.C) and below, and when 80 deg.F (27 deg.C) and above; and each time a set of compression test specimens are made.

4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

a. Fiber reinforced concrete test specimens shall be vibrated externally per recommendations ACI 544.

5. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.

a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 used.

b. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived, if in the Architect's judgement, adequate evidence of satisfactory strength is provided.

c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

e. Test results will be reported in writing to Architect and Contractor on the day after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

3.16 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Design Documents during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

Part II
Division 4

Masonry

SECTION 04100

MORTAR AND MASONRY GROUT

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Mortar and grout for masonry.

1.3 SUBMITTALS

A. Samples: Submit two samples of mortar, illustrating mortar color and color range.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

B. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150, Type I, gray color.

B. Mortar Aggregate: ASTM C144, standard masonry type.

C. Hydrated Lime: ASTM C207, Type S.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Bonding Agent: Epoxy type.

2.2 MORTAR MIXES

A. Mortar for Load Bearing Walls and Partitions: ASTM C270, Type S using the Property Method.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270 C780.

B. Add mortar color and admixtures in accordance with manufacturer's instructions.

C. Do not use anti-freeze compounds to lower the freezing point of mortar.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Apply bonding agent to existing concrete surfaces.

3.2 INSTALLATION

A. Install mortar in accordance with ASTM C780.

B. Work grout into masonry cores and cavities to eliminate voids. Do not displace reinforcement.

3.3 SCHEDULES

A. Masonry Chimneys: Type S mortar with Type N pointing mortar.

…END OF SECTION

SECTION 04300

UNIT MASONRY SYSTEM

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Concrete masonry and brick units, reinforcement, anchorage, and accessories.

1.3 SUBMITTALS

A. Product data: Submit product data for masonry items, indicating compliance with requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements for fire rated masonry construction.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

B. Hot Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

2 PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Block Units: ASTM C90, Type I - Moisture Controlled; normal weight.

B. Solid Load-Bearing Block Units: ASTM C90, Type I - Moisture Controlled; normal weight.

2.2 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet bars, galvanized finish.

2.3 MORTAR AND GROUT

A. Mortar and Grout: As specified in Section 04100.

2.4 FLUE LINER

A. Flue liner: Minimum 5/8" thick fire clay liner; ASTM C315.

2.5 FLASHINGS

A. Copper Flashings: 16 oz/sq ft sheet copper.

2.6 ACCESSORIES

A. Weeps: Preformed plastic tubes, cotton wick filled.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials, recommended by masonry unit manufacturer.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Coordinate placement of anchors supplied to other Sections.

3.2 COURSING

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Concrete Masonry Units:

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

3.3 WEEPS

A. Install weeps in veneer at 24 inches oc horizontally above through-wall flashing.

3.4 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install joint reinforcement as indicated.

3.5 FLUE LINER

A. Install flue liner from a point a minimum of 8" below lowest vent and extend full height of chimney. Provide air space between liner and masonry enclosure. Extend liner above top of chimney and provide mortar wash.

3.6 MASONRY FLASHINGS

A. Extend flashings horizontally at roof intersection.

B. Turn flashing up minimum 8 inches and bed into mortar joint of masonry.

C. Lap end joints and seal watertight.

D. Turn flashing, fold, and seal at corners, bends, and interruptions.

3.7 TOLERANCES

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

B. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

3.8 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.

3.9 CLEANING

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

B. Clean soiled surfaces with cleaning solution.

…END OF SECTION

Part II
Division 5

Metals

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: The drawings and the general provisions of the Contract.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

1.03 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges-Latest Edition."

   Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the Fabricator as part of his preparation of these shop drawings."

2. AISC "Specification for Structural Steel Buildings-1989" including "Commentary" and Supplements thereto as issued.

3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connection of the Engineering Foundation.
4. AWS D1.1 - Latest Edition "Structural Welding Code" - Steel.

5. AWS D1.3 - Latest Edition "Structural Welding Code" Sheet Steel.

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

2. If recertification of welders is required, retesting will be the Contractor's responsibility.

C. Fabricator Qualifications: Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified in Category I of the AISC Quality Certification Program, or be a member of the Structural Steel Fabricators of New England (SSFNE). Provide certification of at least one of the above.

1.04 SUBMITTALS

A. The Engineer of Record (EOR) shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer, and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.

2. High-strength bolts (each type), including nuts and washers.

3. Structural steel primer paint.

C. Shop Drawings:

1. General:

a. Submit shop drawings prepared under the supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams. Include details of cuts, connections, camber, holes and other pertinent data. Re-use of structural contract documents as erection or detail drawings will not be permitted.

b. Indicate welds by standard AWS symbols, and show size, length and type of each weld.

c. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed by others.

2. Connection Design: Submit design calculations for those connections not specifically addressed by the AISC "Manual of Steel Construction" (ASD or LRFD), prepared and stamped by a registered professional engineer.

3. Submittals: Submit (1) blue line print and (1) reproducible transparency (Sepia) of each shop drawing. Submit (2) copies of the connection calculations.

4. Shop Drawing Review: Review of the shop drawings will be made for the size and arrangement of members and the strength of connections. Conformance of the Shop Drawings to the Design Drawing Set remains the responsibility of the General Contractor. This review in no way relieves the General Contractor of this responsibility.

5. The Engineer/Architect reserve the right to make revisions during the shop drawing review. These revisions shall be incorporated into the shop drawings at no additional cost.

6. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Structural Steel Shapes, Plates and Bars: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500, Grade B, Fy = 46 ksi.

C. Steel Pipe: ASTM A 53, Grade B.

D. Anchor Bolts:

1. ASTM A 307, headed type unless otherwise indicated.

2. ASTM A 325, headed type as indicated on drawings.

E. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.

1. Provide hexagonal heads and nuts for all connections.

F. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.

2. Direct tension indicator washers or bolts may be used at Contractor's option.

G. Electrodes for Welding: E70XX and comply with AWS Codes.

H. Structural Steel Primer Paint: TNEMEC 10-99 alkyd rust inhibitive primer, 2.0 to 3.5 mils dry thickness, or approved alternate.

I. Structural Steel Top Coat for steel permanently exposed to view: TNEMEC Series 2 TNEMEC-gloss enamel, 3.0 to 5.0 mils dry thickness, or approved equal unless otherwise noted on drawings. Approval shall be made by the owner's representative. Paint color shall comply with Architectural Specifications.

J. Non Shrink Cement-Based Grout: See section 03300

K. Galvanizing: ASTM A 125, Hot-Dipped.

2.02 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

B. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts". Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

C. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General:

1. Shop paint structural steel, except those members or portions of members to be embedded in mortar or concrete.

2. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only. Do not paint surfaces which are to be welded.

B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose mill scale, splatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2 "Hand Tool Cleaning."

C. Painting:

1. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Apply primer at a rate to provide dry film thickness given in this specification. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

2. Structural steel exposed to weather or as otherwise indicated in drawings shall be top coated with a minimum of two coats of gloss enamel. Apply top coat to meet thickness requirements given in this specification.

PART 3 - EXECUTION

3.01 ERECTION:

A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

B. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved by Engineer of Record. Refer to Section 3.03 B.

C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

D. Anchor Bolts:

1. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

E. Setting Plates and Base Plates:

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of these specifications for anchor bolt installation requirements in concrete.

2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.

3. Set loose and attached base plates for structural members on wedges or other adjusting devices.

4. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

F. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated.

2. Align and adjust various members forming part of complete frame or structure before permanently fastening.

3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

5. Level and plumb individual members of structure within specified AISC tolerance.

6. Splice members only where indicated and accepted on shop drawings.

7. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Erection bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surface.

H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Paint Damage: Touch up shop applied paint whenever damaged or bare. Clean surface and touch up with shop primer noted in Section 2.01 H and top coat, if required.

3.02 QUALITY CONTROL:

A. General:

1. Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the contract documents.

2. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relive the Contractor of his responsiblity for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

B. Testing Agency:

1. Contractor shall engage an independent testing agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.

2. Testing agency reports shall state which specific connections were examined or tested, whether the connections comply with the contract documents and what deviations, if any, were noted. Copies of these reports shall be sent to the Architect for review.

3. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished.

4. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Inspection Requirements:

1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts."

a. Snug Tight Connections:

1. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

2. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the engineer reserves the right to increase the number of bolts tested.

b. Slip Critical Connections:

1. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.

2. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.

2. Welding: Inspect all welded connections in accordance with the procedures outlined in AWS D1.1.

a. Certify welders and conduct inspections and tests as required. Record work required and performed to correct deficiencies.

b. Perform visual inspection of all welds. Welds deemed questionable by visual inspection, all partial and full

penetration welds, and any other welds indicated on the drawings shall be tested by one of the following:

1. Liquid penetrant inspection: ASTM E 165.

2. Magnetic particle inspection: ASTM E 109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".

4. Ultrasonic Inspection: ASTM E 164.

All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

D. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty work shall be borne by the Contractor.

3.03 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for general compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the **State of Maine** and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. This section includes the following metal fabrications:

1. Loose bearing and leveling plates.
2. Miscellaneous framing and supports for the following:

   a. Applications where framing and supports are not specified in other sections.

3. Steel ladders.
4. Steel pipe railings.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each respective component of each metal fabrication.

B. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:

1. Concentrated load of 200 lb applied at any point and in any direction.

2. Uniform load of 50 lb per linear ft. applied horizontally and simultaneous uniform load of 100 lb per linear foot applied vertically downward at the top of the guard.

D. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:

1. Concentrated load of 200 lb applied at any point and in any direction.

2. Uniform load of 50 lb per linear foot applied in any direction.

3. Concentrated and uniform loads above need not be assumed to act concurrently.

E. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lb applied to one sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.

1. Above load need not be assumed to act concurrently with loading conditions on guards or handrails.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

D. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," and D1.3 "Structural Welding Code - Sheet Steel."

C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project is located and experienced in providing engineering services of the kind indicated that have resulted in the successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.6 PROJECT CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show

recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.7 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of handrails as follows:

1. Mount handrails only on completed construction. Do not support handrails temporarily by any means not satisfying structural performance requirements.

2 PART 2 PRODUCTS

2.1 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Steel Tubing: Product type (manufacturing method) and as follows:

1. Cold-Formed Steel Tubing: ASTM A 500, grade as indicated below:

a. Grade B, unless otherwise indicated or required for design loading.

2. Hot-Formed Steel Tubing: ASTM A 501.

D. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

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

F. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.2 GROUT AND ANCHORING CEMENT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

B. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

1. Nonshrink Nonmetallic Grouts:

    a. "Bonsal Construction Grout"; W. R. Bonsal Co.
    b. "Diamond-Crete Grout"; Concrete Service Materials Co.
    c. "Euco N-S Grout"; Euclid Chemical Co.
    d. "Kemset"; Chem-Masters Corp.
    e. "Crystex"; L & M Construction Chemicals, Inc.
    f. "Masterflow 713"; Master Builders.
    g. "Sealtight 588 Grout"; W. R. Meadows, Inc.
    h. "Sonogrout"; Sonneborn Building Products Div., ChemRex Products, Inc.
    i. "Stoncrete NM1"; Stonhard, Inc.
    j. "Five Star Grout"; U. S. Grout Corp.
    k. "Vibropruf #11"; Lambert Corp.

2. Erosion-Resistant Anchoring Cement:

    a. "Super Por-Rok"; Minwax Construction Products Division.

2.3 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

C. Lag Bolts: Square head type, FS FF-B-561.

D. Machine Screws: Cadmium plated steel, FS FF-S-92.

E. Plain Washers: Round, carbon steel, FS FF-W-92.

F. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S- 325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF- B-575, Grade 5.

G. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.4 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint- 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.5 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Division 3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 2,500 psi, 440 lb cement per cu. ft. minimum, and W/C ratio of 0.65 maximum, unless higher strengths indicated.

B. Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

2.6 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. Weld corners and seams continuously to comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

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

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

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling

limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

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

2.7 ROUGH HARDWARE

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

B. Fabricate items to sizes, shapes, and dimensions required.

2.8 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A14.3.

B. Siderails: Continuous steel flat bars, 1/2 inch x 2-1/2 inches, with eased edges, spaced 18 inches apart.

C. Bar Rungs: Square steel bars, 3/4 inch, spaced 12 inches oc.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points spaced not more than 5'-0" oc. by means of welded or bolted steel brackets.

F. Size brackets to support design dead and live loads indicated and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.

G. Provide non-slip surface on top of each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

2.9 LOOSE BEARING AND LEVELING PLATES

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

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.11 STEEL PIPE RAILINGS AND HANDRAILS

A. General: Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

C. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

F. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

H. For railing posts set in concrete fabricate sleeves from steel pipe not less than 6 inches long and with an inside diameter not less than 1/2 inch greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

I. Fillers: Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and overstressing of substrate.

2.12 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 80 steel pipe. Fill bollards with 3000 psi strength concrete. Shape top of concrete into half sphere shape.

2.13 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

2.17 STEEL AND IRON FINISHES

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

1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."

Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning:

B. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

C. Galvanizing: For those items idicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:

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

2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

3 PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

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

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

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

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

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

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

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

3.3 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonmetallic nonshrink grout, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2 inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction.

C. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

D. Set handrail and guardrail posts in sleeves cast into concrete, and fill annular space around posts with non-shrink non-metallic grout.

3.5 INSTALLATION OF BOLLARDS

A. Anchor bollards in concrete footings set below frost level.

3.6 ADJUSTING AND CLEANING

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

B. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

...END OF SECTION

Part II
Division 6

Carpentry

SECTION 06100

ROUGH CARPENTRY

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Structural floor, wall, and roof framing; built-up structural members, wall and roof sheathing; subfloor sheathing; preservative treatment; sill gaskets.

B. Roof curbs and cants; blocking in wall and roof openings; wood furring and grounds; electrical panel backboards, concealed wood blocking.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA.

2 PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Lumber Grading Rules: SPIB, WWPA, NLGA.

B. Joist Framing: S-P-F species, No. 2 & better grade, 19 percent maximum moisture content.

C. Rafter Framing: S-P-F species, No. 2 & better grade, 19 percent maximum moisture content.

D. Non-structural Light Framing: S-P-F species, Standard grade, 19 percent maximum moisture content.

E. Sill Plate: Pressure treated Southern Pine.

2.2 SHEATHING MATERIALS

A. Roof Sheathing: APA Rated Sheathing Structural I, Span Rating 40/20, Exposure 1; unsanded.

B. Floor Sheathing: Plywood, APA Rated Sturd-I-Floor, Span Rating 24 oc, Exposure 1; unsanded.

C. Wall Sheathing: APA Rated Sheathing, Span Rating 32/16, Exposure 1; unsanded.

D. Telephone and Electrical Panel Boards: Plywood, APA C-C Plugged INT.

2.3 SHEATHING AND UNDERLAYMENT LOCATIONS

A. Roof Sheathing: 19/32 inch thick OSB, 48 x 96 inch sized sheets, square edges.

B. Floor Sheathing: 23/32 inch thick plywood, 48 x 96 inch sized sheets, tongue and groove edges.

C. Above Grade Wall Sheathing: 15/32 inch thick OSB, 48 x 96 inch sized sheets, square edges.

2.4 ACCESSORIES

A. Fasteners: Galvanized steel for exterior, high humidity, and treated wood locations, plain finish elsewhere.

B. Die Stamped Connectors: 20 gage thick galvanized steel.

C. Structural Framing Connectors, Joist Hangers: Galvanized steel, sized to suit framing conditions.

D. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fasteners for anchorages to steel.

E. Sill Gasket on Top of Foundation Wall: Plate width, closed cell polyethylene foam strip.

F. Air and Water Infiltration Barrier: Flash spun bonded polyethylene: DuPont Tyvek Housewrap.

2.5 WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

B. Shop preservative treat wood materials indicated on Drawings and in schedule at end of Section, in accordance with manufacturer's instructions.

3 PART 3 EXECUTION

3.1 FRAMING

A. Erect wood framing members in accordance with applicable code. Place members level and plumb. Place horizontal members crown side up.

B. Place sill gasket directly on foundation under exterior wall sills.

C. Place wall studs directly under wood truss, rafter and joist framing members.

D. Frame double joist headers at floor and ceiling openings. Frame rigidly into joists. Frame double joists under wall studding.

E. Bridge joists framing in excess of 8 feet span at mid-span members. Fit solid blocking bridging at ends of members.

F. Curb all roof openings except where curbs are provided. Construct curb members of single pieces per side.

3.2 SHEATHING

A. Install roof sheathing continuous over supports with 48 inches minimum length. Fasten with 6d deformed shank nails, 6” oc at edges, 12” oc at intermediate supports.

B. Install floor sheathing continuous over supports with 48 inches minimum length. Fasten with 6d deformed shank nails, 6” oc at edges, 12” oc at intermediate supports.

C. Secure wall sheathing with ends staggered, over firm bearing. Fasten with 6d deformed shank nails, 6” oc at edges, 12” oc at intermediate supports. Provide 2x blocking at all horizontal joints.

D. Place air and water infiltration barrier over wall sheathing, tape seal lap joints and end laps, staple in place.

E. Use galvanized steel sheathing clips between sheets between roof framing members.

F. Install telephone and electrical panel backboards with plywood sheathing material where required. Size the backboard by 12 inches beyond size of electrical panel.

3.3 WOOD TREATMENT SCHEDULE

A. Wood wall and partition sills in contact with concrete.
B. Wood blocking in contact with roofing materials.
C. Wood in contact with earth.

…END OF SECTION

SECTION 06190

PREFABRICATED TIMBER TRUSSES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. RELATED DOCUMENTS: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK:

A. Definition: Prefabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.

B. Types of fabricated wood trusses are indicated on the drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 06100 - Rough Carpentry

1.04 QUALITY ASSURANCE:

A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:

1. "Design Specification for Metal Plate Connected Wood Trusses."

2. Commentary and Recommendations for Handling and Erecting Wood Trusses."

3. "Commentary and Recommendations for Bracing Wood Trusses."

4. "Quality Control Manual."

B. Wood Structural Design Standard: Comply with applicable requirements of NFPA "National Design Specification for Wood Construction."

C. Lumber Standard: Comply with PS 20 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.

D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI "Quality Control Manual."

E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and participates in the TPI "Quality Control Inspection Program" as a licensee authorized to apply TPI marks to trusses.

F. Uniformity of Manufacture for Connector Plates: Provide metal connector plates from a single manufacturer.

1.05 SUBMITTALS:

A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.

B. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process and treatment (if any).

1. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

C. Shop Drawings:

1. General: Submit shop drawings, prepared under the supervision of a professional engineer, showing species, sizes and stress grade of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required; type, size, material, finish, design value and location of metal connector plates; and bearing and anchorage details.

2. Design: To the extent engineering design considerations are indicated as the Fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assembled allowable stress, stress diagrams and calculations and similar information needed for analysis and to ensure that trusses comply with requirements.

3. Engineer Stamp: Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in the State of Maine.

4. TPI Approval: All drawing submittals must bear a TPI stamp.

5. Submittal: Submit (1) blue line print and (1) reproducible transparency (Sepia) of each shop drawing.

1.06 DELIVERY, STORAGE, HANDLING

A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI 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 LUMBER

A. General: Factory mark each plate of lumber with type, grade, mill and grading agency.

B. Sizes: 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.

C. Moisture Content: Provide seasoned lumber with a maximum moisture content of 19% at time of dressing.

D. Lumber Grade: Lumber members will be graded in accordance with the following grading agency requirements:

1. Eastern Woods: NELMA or NHPMA

2. Western Woods: WWPA

3. Southern Pine: SPIB

2.02 METAL CONNECTOR PLATES, FASTENERS AND ANCHORAGES

A. Connector Plate Material: Use metal not less than "0.036" thick, coated thickness, (Contractor's option if more than one metal indicated).

1. Galvanized Sheet Steel: ASTM A 446, Grade A, Coating G60.

2. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connector plates which may be incorporated in the work, but are not limited to, the following:

a. Gang Nail Systems, Inc.
b. Hydro-Air Engineering, Inc.
c. Inter-Lock Steel Co., Inc.
d. Link-Wood Construction Systems
e. Robbins Manufacturing Co.
f. Tee-Lok Corp.
Truss Connectors of America
Truswall Systems Corp.

2.03 FIRE RETARDANT TREATMENT:

A. Not applicable.

2.04 FABRICATION:

A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.

B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.

C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with

close fitting joints. Position members to produce design camber indicated.

D. Connect truss members by means of metal connector plates accurately located and securely fastened to wood members by means indicated or approved.

PART 3 - EXECUTION

3.01 GENERAL

A: Erect and brace trusses to comply with the recommendations of the Manufacturer and the TPI publications referenced above.

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 lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

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

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

E. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.

F. Do not cut or remove truss members.

3.02 ENGINEER'S REVIEW

A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.

B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for

construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SUMMARY

A. Finish carpentry items, other than shop prefabricated casework; hardware and attachment accessories.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with AWI Quality Standards, Custom Grade.

2 PART 2 PRODUCTS

2.1 LUMBER MATERIALS

A. Softwood Lumber: PS 20; Graded in accordance with AWI Custom ; clear Eastern White Pine species, plain sawn, maximum moisture content of 11 percent.

B. Hardwood Lumber: Graded in accordance with AWI Custom ; Red Oak species, plain sawn, maximum moisture content of 11 percent; of quality suitable for transparent finish.

2.2 ACCESSORIES

A. Fasteners: Size and type to suit application; hot dipped galvanized steel for exterior, high humidity and treated wood locations, plain finish elsewhere.

B. Primer: Alkyd primer sealer type.

2.3 FABRICATION

A. Fabricate to AWI Custom standards.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Prime paint back surfaces of items or assemblies, before installation. Where transparent finish is scheduled, back prime with spar varnish.

3.2 INSTALLATION

A. Install work in accordance with AWI Custom quality standard.

B. Set and secure materials and components in place, plumb and level.

C. Install trim by nails. .

3.3 PREPARATION FOR FINISH

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

B. Site Finishing: Refer to Section 09900.

3.4 SCHEDULE

A. Exterior:

1. Exposed Wood Trim: White pine, prepare for paint finish.

B. Interior:

1. Window Sills: Clear white pine, prepare for paint finish.
2. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine, prepare for paint finish.
3. Wall Caps: Red Oak, prepare for transparent finish.

…END OF SECTION

SECTION 06402

ARCHITECTURAL WOODWORK

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood cabinets (casework).
2. Cabinet tops (countertops).
3. Interior miscellaneous ornamental items.

B. Related Sections: The following sections contain requirements that relate to this section:

C. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work that is not exposed to view.

D. Division 6 Section "Finish Carpentry" for carpentry exposed to view that is not specified in this section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Single-Source Responsibility: Arrange for production by a single firm of architectural woodwork.

C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this project.

D. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

E. Hardware Coordination: Coordinate cabinet shop drawings and fabrication with hardware requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's and Installer's coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated and, where the following products are part of woodwork, with requirements of the referenced product standards, that apply to product characteristics indicated:

1. High Pressure Laminate: NEMA LD 3.
2. Particleboard: ANSI A208.1, 45pcf density
3. Softwood Plywood: PS 1, AA grade.

B. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:

1. Particleboard: NPA 8.
2. Hardwood Plywood: HPMA FE.

2.2 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a water-resistant coating.

2.3 LAMINATE CLAD CABINETS

A. Quality Standard: Comply with AWI Section 400 and its Division 400B "Laminate Clad Cabinets."

1. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Case Body: All joints glued.

1. Top, Bottom and Fixed Horizontals: Lock jointed, dadoed or rabbeted into ends/dividers and screwed or doweled at approximately 2 1/2" oc.
2. Back: Dadoed or rabbeted into top, sides and bottom.
3. Fixed Small Compartment Dividers: Dadoed.

D. Drawers with Sub Front: All joints glued.

1. All corners: Dovetailed or doweled; or front corners dovetailed and back corners lock jointed.
2. Bottom: Dadoed into all four sides.
3. Front: Screwed into subfront.
4. Top Edges: Box-rounded.

E. Laminate Cladding: High pressure decorative laminate complying with the following requirements:

1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

2. Provide selections made by Architect from laminate manufacturer's full range of standard colors and finishes.

F. Laminate Grade for Exposed Surfaces: Provide laminate cladding complying with the following requirements for type of surface and grade.

1. Horizontal Surfaces Other Than Tops: GP-50 (0.050-inch nominal thickness).
2. Vertical Surfaces: GP-50 (0.050-inch nominal thickness).
3. Edges: GP-50 (0.050-inch nominal thickness).

G. Provide backer sheet on each plastic laminated item:

1. Semi exposed: Grade C120 (0.020 inch nominal thickness).
2. Concealed: Grade BK20 (0.020 inch nominal thickness).

2.4 WOOD CABINETS

A. Quality Standard: Comply with AWI Section 400 and its Division 400A "Wood Cabinets."

1. Grade: Custom.

B. AWI Type of Cabinet Construction: Reveal overlay.

C. Case Body: All joints glued.

1. Top, Bottom and Fixed Horizontals: Lock jointed, dadoed or rabbeted into ends/dividers and screwed or doweled at approximately 2 1/2" oc.
2. Back: Dadoed or rabbeted into top, sides and bottom.
3. Fixed Small Compartment Dividers: Dadoed.

D. Drawers with Sub Front: All joints glued.

1. All corners: Dovetailed or doweled; or front corners dovetailed and back corners lock jointed.
2. Bottom: Dadoed into all four sides.
3. Front: Screwed into subfront.
4. Top Edges: Box-rounded.

E. Stiles and Rails: 2-1/2" wide x 3/4" thick, premium White Maple.

F. Door Panels: Raised panels, premium White Maple.

2.5 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.

1. Brushed Aluminum.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.

2.6 ARCHITECTURAL CABINET TOPS (COUNTERTOPS)

A. Quality Standard: Comply with AWI Section 400 and its Division 400C.

B. Type of Top: High pressure decorative laminate complying with the following:

1. Grade: Custom.

C. Core: Veneer core, spruce faced plywood or particleboard.

D. Laminate Cladding for Horizontal Surface: High pressure decorative laminate as follows:

1. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

2. Provide selections made by Architect from manufacturer's full range of standard colors and finishes.

3. Grade: GP-50 (0.050-inch nominal thickness).

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

2.7 INTERIOR MISCELLANEOUS ORNAMENTAL ITEMS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 700.

B. Lumber Species: Match species and cut indicated for other types of transparent finished architectural woodwork located in same areas of building unless otherwise indicated.

2.8 INTERIOR MISCELLANEOUS ORNAMENTAL ITEMS FOR OPAQUE FINISH

A. Quality Standard: Comply with AWI Section 700.

B. Lumber Species: Any closed-grain hardwood listed in referenced woodworking standard.

2.9 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

B. For metal framing supports, provide screws as recommended by metal framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.10 FACTORY FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500 unless otherwise indicated.

B. General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.

C. Factory Finishing: To the greatest extent possible, finish architectural woodwork at factory. Defer only final touch-up, cleaning, and polishing until after installation.

D. General: The primary and prefinishing (if any) of interior architectural woodwork required to be performed at factory is specified in this section. Refer to Division 9 Section "Painting" for final finishing of installed architectural woodwork and for material and application requirements of prime coats for woodwork not specified to receive final finish in this section.

E. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

F. Transparent Finish for Closed-Grain Woods: Comply with requirements indicated below for grade, finish system, staining, effect, and sheen.

1. Grade: Custom.
2. AWI Finish System #5: Catalyzed polyurethane.
3. Staining: Match approved sample for color.
4. Sheen: Dull satin 15-20 deg.

2.11 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Plastic Laminate:

a. Formica Corp.
b. Nevamar Corp.
c. Ralph Wilson Plastics Co.

2. Plastic Overlay Panel Products:

a. Simpson Timber Co.
b. Sel-Ply Div./Medford Corp.

3. Cabinet Hardware:

a. National Lock Co.
b. EPCO.
c. Grant.
d. Knape & Vogt.
e. Ives.
f. Stanley.
g. Stylemark.
h. Webber Knapp.

4. Stains and Varnishes:

   a. Fuller O'Brien /Div. ICI Paints.
   b. Glidden /Div. ICI Paints.
   c. Pratt & Lambert.

3 PART 3 EXECUTION

3.1 PREPARATION

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

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

C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Standing and Running Trim and Rails: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns and miter at corners.

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

G. Tops: Anchor securely to base units and other support systems as indicated.

H. Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

3.3 ADJUSTMENT AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that woodwork is being without damage or deterioration at time of Substantial Completion.

3.5 HARDWARE SCHEDULE

A.	Cabinet door hinges	Concealed type pivot hinges, Stanley or equal.
B.	Door and drawer pulls	Wire type, 4" face dimension, Stanley or equal.
C.	Drawer glides	Full extension, 150lb cap.
D.	Door latches	Magnetic type.
E.	Locks	Heavy duty institutional pin tumbler type, National Lock M2-0106
F.	Wall Standards and Brackets	See Section 06402, 2.7 Adjustable Wood Shelving

...END OF SECTION 06402

SECTION 06670
PVC FABRICATIONS

1 PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cellular PVC Trim Boards for corner boards, soffits, fascias, battens, door pilasters, frieze boards, rake boards, architectural millwork and door/window trim.

1.2 RELATED SECTIONS

A. Section 06445 - Simulated Wood Ornaments: Fluted Pilasters, Columns.

B. Section 06455 - Simulated Wood Trim: Standing and Running Trim.

C. Section 07460 - Plastic Siding: Composite material used on exterior wall or soffit.

1.3 REFERENCES

A. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.

B. ASTM D570 - Water Absorption of Plastics.

C. ASTM D638 - Tensile Properties of Plastics.

D. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D1761 - Mechanical Fasteners in Wood.

F. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.

G. ASTM D256 - Determining the Pendulum Impact Resistance of Plastics.

H. ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.

I. ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

J. ASTM E84 - Surface Burning Characteristics of Building Materials.

K. ASTM D648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

L. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, manufacturer's catalogs, SPEC-DATA® product Sheet, for specified products.

C. Samples: Submit three material samples representative of the texture, thickness and widths shown and specified herein.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Check with Local Building Code for installation requirements.

B. Allowable Tolerances:

1. Variation in component length: -0.00 / +1.00"

2. Variation in component width: ± 1/16"

3. Variation in component thickness: ± 1/16"

4. Variation in component edge cut: ± 2°

5. Variation in Density -0% + 10%

C. Workmanship, Finish, and Appearance:

1. Cellular PVC that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square, and top and bottom surfaces shall be flat with no convex or concave deviation.

2. Uniform surface free from cupping, warping, and twisting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.7 WARRANTY

A. Provide manufacturer's 25 year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

2 PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable products: AZEK™ Trimboards manufactured by Vycom Corporation, 801 Corey Street, Moosic, PA 18507.

B. Material: Expanded rigid poly vinyl chloride material with a small-cell microstructure and density of .55 grams/cm³.

1. Material shall have a minimum physical and performance properties specified in the following Section C.

C. Performance and physical characteristic requirements:

Property	Units	Value	ASTM Method
PHYSICAL			
Density	g/cm3	0.55	D 792
Water Absorption	%	0.15	D 570
MECHANICAL			
Tensile Strength	psi	2256	D 638
Tensile Modulus	psi	144,000	D 638
Flexural Strength	psi	3329	D 790
Flexural Modulus	psi	144,219	D 790
Nail Hold	Lbf/in of penetration	35	D 1761
Screw Hold	Lbf/in of penetration	680	D 1761
Staple Hold	Lbf/in of penetration	180	D 1761
Gardner Impact	in-lbs	103	D5420
Charpy Impact (@23°C)	ft-lbs	4.5	D256
THERMAL			
Coefficent of Linear Expansion	in/in/°F	3.2 x 10-5	D 696
Burning Rate	in.min	Not burn with flame removed	D 635
Flame Speed Index	--	20	E 84
Heat Deflection Temp 264 psi	°F	150	D648
Oil Canning (@140°F)	°F	Passed	D 648

2.2 ACCESSORY PRODUCTS

A. Fasteners: All types of fasteners that work well with wood will work as well or better with AZEK™. Provide white-painted full round head stainless-steal fasteners. Fasteners from a nail gun work well.

B. Adhesives:

1. Bonding AZEK™ to AZEK™, solvent based adhesive systems used for rigid PVC pipe work very well. Latex adhesives provide more working time.

2. Bonding AZEK™ to Various Substrates, numerous standard construction adhesives work well. In general, contact cement, epoxy, rubber based and urethane adhesives are acceptable. Test a particular adhesive for suitability.

C. Sealants:

1. Use urethane, polyurethane or acrylic based sealants without silicone.

2.3 FINISHES

A. Preparation:

1. Clean, Dry surface

2. Nail holes may be finished with a poly urethane or acrylic based caulk, or painted over.

3 PART 3 - EXECUTION

3.1 INSTALLATION

A. Manufacturers instructions: Comply with manufacturers product catalog installation instructions and product technical bulletin instructions.

B. Cutting: Sheets and boards can be cut using standard saws and carbide blades used for wood.

C. Drilling: Drilling can be accomplished using twist drills recommended for metals.

D. Milling: Milling can be accomplished using standard milling machines of various types. Relief Angle 20° to 30°; Cutting speed to be optimized with the number of knives and feed rate.

E. Routing: Routing can be accomplished using standard carbide tipped routers used in woodworking.

F. Edge Finishing: Various sanding, grinding or filing tools. Do not allow excessive frictional heat to build up.

G. Nail Location: Standard nailing patterns are recommended. You can fasten closer to the edge than with wood.

H. Linear Thermal Expansion and Contraction: When properly fastened, allow for 1/8” movement for each 18’ board. When butting boards together it is recommended that the butt joint is glued with PVC cement. This will eliminate any separation at the joint. The gap can be accommodated at the ends of the run.

…END OF SECTION

Part II
Division 7

Thermal and Moisture Protection

SECTION 07195

AIR INFILTRATION BARRIER

1 PART 1 GENERAL

1.1 SUMMARY:

A. Includes but not limited to:
Furnish and install over exterior of wall sheathing at all locations regardless of whether or not indicated on drawings to protect exterior sheathing and interior walls.

1.2 REFERENCES:

A. AATCC – 127

B. TAPPI T – 460 (sec/100cc)

C. ASTME 96 (g/m2 –24 hr.)

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the conditions of the Contract and Division I Specifications Sections.

B. Product Data: Submit product specifications, technical data and installation instructions of manufacturer equaling or exceeding those specified.

2 PART 2 PRODUCTS

2.1 AIR INFILTRATION BARRIER/SECONDARY WEATHER RISISTIVE MEMBRANE:

A. Spun-bonded olefin, None-woven, Non-perforated.

B. Performance Requirements

1. Water penetration resistance of 210 cm in accordance with AATCC – 127

2. Air infiltration at 300 seconds in accordance with TAPPI T – 460 (sec/100cc)

3. Water vapor transmission of 58 perms in accordance with ASTM E 96 Method B(g/m2 – 24 hr.)

4. Basis weight of 2.5oz/yd in accordance with TAPPIT- 410

C. Membrane shall be free from holes and breaks other than those created by fasteners and construction system due to attachment

D. Approved Manufacturer:

1. DuPont Tyvek® CommercialWrap® by DuPont Company, Wilmington, Delaware

2. No Alternates or Substitutions

2.2 SEALING TAPE/FASTENERS

A. Approved Tape Manufacturers:

1. DuPont Contractor Tape, by DuPont Company, Wilmington Delaware

B. Recommended Fasteners for Wood Framed construction:

1. Nails with large Heads or plastic washers.

C. Recommended Fasteners for Steel Framed Construction:

1. Rust resistant screws with washers

D. Recommended Fastening to Masonry:

1. Polyurethane or elastomeric adhesives

3 PART 3 EXECUTION

3.1 AIR INFILTRATION BARRIER

A. Install Air Infiltration Barrier over exterior side of exterior wall sheathing.

B. Install Air Infiltration Barrier after sheathing is installed and before windows and doors are installed. Install lower level barrier prior to upper layers to ensure proper shingling of layers.

C. Overlap Air Infiltration Barrier at corners of building by a minimum of 12 inches.

D. Overlap Air Infiltration Barrier vertical seams by a minimum of 6 inches.

E. Ensure barrier is plum and level with foundation, and unroll extending Air Infiltration Barrier over window and door openings.

F. Attach Air Infiltration Barrier to wood, insulated sheathing board or exterior gypsum with plastic cap nails every 12” to 18” on vertical stud line with wood stud framing, and screws with washers to metal stud framing.

G. Prepare window and door rough openings as follows:

1. Prepare each window rough opening by cutting a modified “I” pattern in the Air Infiltration Barrier. This is done as follows:

a. Horizontally cut Air Infiltration along bottom of header.

b. Vertically cut Air Infiltration Barrier down the center of window openings from the top of the window opening down to 2/3 of the way to the bottom of the window openings.

c. Diagonally cut Air Infiltration Barrier from the bottom of the vertical cut to the left and right corners of opening.

d. Fold side and bottom flaps into window opening and fasten every 6 inches. Trim off excess.

2. Prepare each rough door opening by cutting a standard “I” pattern in the Air Infiltration Barrier. This is done as follows:

a. Horizontally cut Air Infiltration Barrier along bottom of door frame header and along top of sill.

b. Vertically cut Air Infiltration Barrier down the center of door openings from the top of the door opening (header) down to the bottom of the door opening (sill).

c. Fold side flaps inside around door openings and fasten every 6 inches. Trim off excess.

H. Tape all horizontal and vertical seam of Air Infiltration Barrier.

I. Tape a patch over all tears and cuts in Air Infiltration Barrier.

…END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Firestopping materials and accessories.

1.3 SYSTEM DESCRIPTION

A. Firestopping Materials: Complete systems of materials tested under ASTM E119 ASTM E814 UL 263 UL 1479 to achieve a fire rating as noted on Drawings.

B. Surface Burning: ASTM E84 UL 723 with a flame spread / smoke developed rating of 0/0

C. Firestop all interruptions to fire rated assemblies, materials and components.

1.4 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance and limitation criteria.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Schedule: Provide a schedule of openings and penetrations requiring firestopping and firesafing. Correlate with products submitted, fire ratings, and testing agency test results.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

A. Manufacturers:

1. Isolatek International (Cafco Products).

2. Specified Technologies Inc.

3. 3M Fire Protection Products.

4. United States Gypsum Co.

B. Firestopping Material: Mineral fiber stuffing insulation.

1. USG Thermafiber Safing Insulation.

SECTION 07210

BUILDING INSULATION

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Board thermal insulation at foundation wall perimeter.

B. Batt thermal insulation and vapor retarder in exterior wall and roof construction.

1.3 SYSTEM DESCRIPTION

A. System performance to provide continuity of thermal barrier and vapor retarder at building enclosure elements.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Install insulation adhesives in accordance with manufacturer's instructions.

2 PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Extruded Polystyrene Insulation: ASTM C578, cellular type, conforming to the following:

1. Thermal Resistance: R of 5.0 per inch.
2. Thickness: Thickness indicated.
3. Compressive Strength: Minimum 30 psi .
4. Water Absorption: In accordance with ASTM D2842 0.3 percent by volume maximum.
5. Edges: Square edges.

B. Batt Insulation: ASTM C665, preformed glass fiber batt, conforming to the following:

1. Thermal Resistance: R of 19 for walls, 38 for ceilings.
2. Facing: Unfaced.

C. Ventilation Baffles: Formed plastic used with attic insulation.

2.2 ADHESIVES

A. Adhesive: Type recommended by insulation manufacturer for application.

2.3 ACCESSORIES

A. Vapor Retarder: Clear polyethylene film, 6 mil thick.

B. Tape: Polyester self-adhering type.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

3.2 INSTALLATION - FOUNDATION PERIMETER - BOARD INSULATION

A. Apply adhesive and install boards on foundation perimeter. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.

B. Place insulation boards under slab edge.

3.3 INSTALLATION - BATT INSULATION

A. Install insulation, ventilation baffles and vapor retarder in accordance with insulation manufacturer's instructions.

B. Install in exterior walls and ceiling spaces without gaps or voids.

C. Fit insulation tight in spaces. Leave no gaps or voids.

D. Install friction fit insulation tight to framing members, completely filling prepared spaces.

E. Place vapor retarder on warm side of insulation by securing in place. Extend vapor retarder tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Tape seal in place.

…END OF SECTION

a. Density: 4.0 lb/cu ft.

C. Firestopping Material: Single component mortar compound.

1. Cafco TPS Mortar.

2. SpecSeal Fire Rated Mortar SSM

3. USG Firecode Compound.

D. Firestopping Material: Single component elastomeric compound.

1. Cafco TPS Type C.

2. SpecSeal Latex Sealant LC150

3. 3M Fire Barrier CP 25WB+ Caulk.

4. USG Smoke-Seal Compound.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

B. Dam Material: Permanent:

1. As required by manufacturer to meet system listing.

C. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify openings are ready to receive the work of this section.

B. Clean substrate surfaces of matter which may effect bond of firestopping material.

C. Install backing materials to arrest liquid material leakage.

3.2 APPLICATION

A. Apply primer and materials in accordance with manufacturer's instructions.

B. Apply firestopping material in sufficient thickness to achieve rating, in manner consistent with tested and listed assemblies.

C. Install material at openings and edge of floor slabs requiring firestopping.

D. Install material at walls or partition openings which contain penetrating sleeves, piping, duct work, conduit and other items, requiring firestopping.

E. Protect installed firestopping from damage during construction operations.

…END OF SECTION

SECTION 07311

ASPHALT SHINGLES

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Granular surfaced asphalt shingle roofing, underlayment, eave, valley, and ridge protection, metal flashings.

1.3 SUBMITTALS

A. Product Data: Provide data indicating material characteristics, and limitations.

B. Samples: Shingle samples for selection.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Steep Roofing Manual.

1.5 WARRANTY

A. Provide 25 year warranty under provisions of Section 01001.

2 PART 2 PRODUCTS

2.1 ASPHALT SHINGLES

A. Manufacturers:

1. IKO Product Renaissance XL

B. Asphalt Shingles: ASTM D225, Type I uniform non-uniform thickness; UL Rating of C and Wind Resistance Label, organic felt base, mineral granule surfaced type; 248 lb/100 sq. ft. weight; self sealing type; square tab; color as selected.

2.2 SHEET MATERIALS

A. Eave (Ice Dam) Protection: Sheet barrier of rubberized asphalt bonded to sheet polyethylene, 40 mil total thickness, with strippable treated release paper; Ice & Water Shield manufactured by WR Grace.

B. Underlayment: No. 15 unperforated asphalt saturated felts.

2.3 ACCESSORIES

A. Nails: Standard hot dipped zinc coated steel type, of sufficient length to penetrate roof sheathing.

B. Plastic Cement: Asphalt type with mineral fiber components.

C. Ridge Vent: Continuous preformed ridge ventilator providing not less than 18 sq. in. free area per linear foot.

1. Manufacturer/Product: Benjamin Obdyke Inc.: Roll Vent;.

2.4 FLASHING MATERIALS

A. Sheet Flashings: ASTM B209; 0.030 inch thick aluminum.

B. Drip Edge: 0.030 inch thick aluminum, 5” width.

2.5 FLASHING FABRICATION

A. Form flashings to profiles indicated on Drawings, and to protect roofing materials from physical damage and shed water.

B. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.

C. Form step flashings with minimum 6” vertical and horizontal legs.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that plumbing stacks and roof penetrations are flashed to deck surface.

B. Verify deck surfaces are dry, free of ridges, warps, or voids. Broom clean surfaces.

C. Fill knot holes and surface cracks with latex filler at areas of bonded eave protection.

3.2 INSTALLATION - EAVE ICE DAM PROTECTION

A. Place eave and gable edge metal flashings tight with fascia boards. Weather lap joints and seal with plastic cement. Secure flange with nails.

B. Apply rubberized asphalt/polyethylene sheet eave protection in accordance with manufacturer's instructions.

C. Extend eave protection membrane minimum 4 ft upslope beyond interior face of exterior wall.

D. Extend eave protection membrane a minimum of 18”” up face of walls and on roof surface at wall/roof intersections

3.3 INSTALLATION - PROTECTIVE UNDERLAYMENT

A. Place one ply of underlayment over area not protected by eave protection, with ends and edges weather lapped and nailed. Stagger end laps of each consecutive layer.

B. Install perpendicular to slope of roof.

C. Weather lap and seal watertight with plastic cement, items projecting through or mounted on roof.

3.4 INSTALLATION - VALLEY PROTECTION

A. Place rubberized asphalt/polyethylene sheet centered over valleys. Weather lap joints and nail in place.

B. Extend shingles on both slopes across valley in a weave pattern and fasten. Extend shingles beyond valley centerline to achieve woven valley, concealing the valley protection.

3.5 INSTALLATION - METAL FLASHING

A. Weather lap joints and seal weather tight with plastic cement. Secure in place with concealed fastenings. Extend bottom of step flashings to daylight.

B. Flash and seal work projecting through or mounted on roofing with plastic cement, weather tight.

3.6 INSTALLATION - ASPHALT SHINGLES

A. Install shingles in accordance with manufacturer's instructions.

B. Provide double course of shingles at eaves.

C. Place shingles in straight coursing pattern with required weather exposure to produce double thickness over full roof area.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Cap hips and ridges with individual shingles, maintaining weather exposure. Place to avoid exposed nails.

F. Complete installation to provide weather tight service.

3.7 INSTALLATION – RIDGE VENT

A. Install ridge vent in accordance with manufacturer’s instructions.

B. Center ridge vent over continuous 2” opening in sheathing and secure to sheathing.

C. Cap ridge vent with shingles.

…END OF SECTION

SECTION 07460

SIDING

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Solid vinyl siding for walls and soffits.

B. Related trim, flashings, accessories, and fastenings.

1.3 SUBMITTALS

A. Product Data: Provide data indicating materials, component profiles, fastening methods, jointing details, sizes, surface texture, finishes, and accessories.

B. Samples: Submit samples for selection of surface texture and color.

1.4 WARRANTY

A. Provide limited lifetime warranty under provisions of Section 01001.

2 PART 2 PRODUCTS

2.1 SIDING MATERIALS

A. Manufacturers:

1. Alcoa.
2. Alside.
3. Bird.
4. CertainTeed.
5. Wolverine Technologies.

B. Extruded Polyvinyl Chloride: Minimum 0.044 inches thick; without integral backing material; smooth finish; double 4 inch clapboard pattern; with integral color; as selected, manufactured to comply with the requirements of ASTM D 3679.

C. Cast Polypropylene Cedar Shingle Siding: Minimum 0.100 inches thick, cedar shingle pattern cast in, with integral color as selected. Provide system integral “Woven Corner” at all exterior corners. Tensile strength: 3,500 psi, ASTM D 638; tensile modulus 180,000 psi, ASTM D638; fexural modulus: 180,000 psi. ASTM D 790.

2.2 ACCESSORIES

A. Nails: Hot dipped galvanized type, non-staining.

B. Accessory Components: Vented soffits, brake metal clad facias, starter strips and trim as required for a complete installation and as indicated on the Drawings..

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install siding and soffits in accordance with manufacturer's instructions.

B. Install siding for natural watershed.

C. Align level, and plumb. Locate cut edges and ends over bearing.

D. Install metal flashings at internal and external corners sills head of wall openings and horizontal joints of sheet materials.

E. Install corner strips, closures, and trim.

F. Miter corners of J-channels and window/door trim.

G. Allow for thermal movement at overlap joints.

H. Install sealant to prevent weather penetration. Maintain neat appearance.

…END OF SECTION

SECTION 07530

SINGLE PLY MEMBRANE ROOFING

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes single-ply membrane roofing systems, including roof insulation.

B. Types of roofing systems specified in this section utilizing single ply roofing membranes include the following:

1. Fully adhered systems.

C. Single ply roofing membranes include the following:

1. Ethylene propylene diene monomer (EPDM)

D. Wood nailers, blocking, and other related items are specified in Division 6.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data, installation instructions, and general recommendations from manufacturer of single ply membrane system for types of roofing required. Include data substantiating that materials comply with

C. requirements.

D. Shop drawings showing roof configuration, sheet layout, seam locations, details at perimeter, and special conditions.

E. Pre-roofing Conference records.

F. Test data for pullout resistance of fastening systems.

1.4 QUALITY ASSURANCE

A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide only secondary materials as recommended by manufacturer of primary materials.

B. Installer: Engage an experienced Installer to apply single ply membrane roofing who has specialized in application of roofing systems similar to those required for this project. Installer must be acceptable to or licensed by manufacturer of primary roofing material.

C. Work associated with single ply membrane roofing, including (but not limited to) insulation, flashing and counterflashing, expansion joints, and joint sealers, is to be performed by Installer of this work.

D. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site, or other mutually agreed location, with Installer, roofing sheet manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Architect, and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours' advance notice to participants prior to convening pre-roofing conference.

E. UL Listing: Provide labeled materials that have been tested and listed by UL in "Building Materials Directory" or by other nationally recognized testing laboratory for application indicated, with "Class A" rated materials/system for roof slopes shown.

1.5 PROJECT CONDITIONS

A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition.

1.6 WARRANTY

A. Special Project Warranty: Submit two executed copies of 15-year "Roofing Warranty" on form acceptable to Owner, covering work of this section including roofing membrane, composition flashing, roof insulation, and roof accessories, signed and countersigned by Installer (Roofer) and Contractor.

B. Manufacturer's Warranty: Submit executed copy of single ply membrane manufacturer's "Membrane System Warranty" agreement including flashing endorsement, signed by an authorized representative of manufacturer. Provide form that was published with product literature as of date of Contract Documents, for the following period of time:

1. 15 years after date of Substantial Completion.

2 PART 2 PRODUCTS

2.1 GENERAL

A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances, and are acceptable to manufacturer of primary membrane.

B. Compatibility: Provide products that are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.2 EPDM MEMBRANE

A. General: Ethylene propylene diene monomers formed into uniform, non-reinforced flexible sheets, laminated to 0.055” thick non woven polyester fleece backing, complying with ASTM D 4637, Type III.

1. Thickness: 45 mils, nominal.
2. Exposed Face Color: Manufacturer's standard.

B. Fully Adhered EPDM Membrane: Manufacturer's standard installation.

C. Products: Subject to compliance with requirements, provide one of the following:

1. FleeceBACK 100 Adhered Roofing System; Carlisle Syntec Systems.

2.3 AUXILIARY MATERIALS

A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.

B. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.

C. Flashing Material: Manufacturer's standard system compatible with flexible sheet membrane.

D. Mechanical Fasteners: Metal plates, caps, battens, accessory components, fastening devices, and adhesives to suit substrate and as recommended by membrane manufacturer.

E. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand min. 55 mph wind speed.

2.4 INSULATING MATERIALS

A. General: Provide insulating materials to comply with requirements indicated for materials and compliance with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

2.5 AUXILIARY INSULATION MATERIALS

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire resistance requirements.

1. Provide system tested and approved for I-60 wind uplift rating.

B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints and filling voids.

3 PART 3 EXECUTION

3.1 PREPARATION OF SUBSTRATE

A. General: Comply with manufacturers' instructions for preparation of substrate to receive single ply membrane system.

B. Verify that penetrations, expansion joints, and blocking are in placed and secured and that roof drains are properly clamped into position.

C. Clean substrate of dust, debris, and other substances detrimental to FSR system work. Remove sharp projections.

D. Install flashings and accessory items as shown, and as recommended by manufacturer if not shown.

E. Prime substrate where recommended by manufacturer of materials being installed.

F. Prevent compounds from entering and clogging drains and conductors and from spilling or migrating onto surfaces of other work.

3.2 INSULATION INSTALLATION

A. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope.

B. Do not install more insulation each day than can be covered with membrane before end of day or before start of inclement weather.

C. Secure roof insulation to substrate with adhesive as specified by manufacturer for wind class indicated, but in no case provide less anchorage than required by FM "Loss Prevention Data Sheet 1-28."

3.3 MEMBRANE INSTALLATION

A. General: Start installation only in presence of manufacturer's technical representative, and install roofing system components in strict accordance with membrane manufacturer’s specifications and shop drawings.

B. Fully Adhered Membrane: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer, and bonding and sealing seams. Install adhesive as recommended by manufacturer. Install flashings and counterflashings as shown or recommended by manufacturer.

C. Cut out and repair membrane defects at end of each day's work.

D. Walkway Protection: Install protection pads at locations shown and where required for access to roof-mounted equipment. Place protection pads carefully to avoid damage to membrane, laying over an additional layer of roof membrane material, loosely applied, for additional protection.

3.4 PROTECTION OF ROOFING

A. Upon completion of roofing (including associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at a time when remaining construction will in no way affect or endanger roofing, make a final inspection of roofing with a representative of membrane manufacturer and prepare a written report to Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at time of final inspection to a condition free of damage and deterioration at time of Substantial Completion and acceptable to membrane manufacturer in accordance with requirements of specified warranty. Conduct a re-inspection of roofing with a representative of membrane manufacturer when all repair work has been done to verify acceptability.

…END OF SECTION 07530

SECTION 07620

SHEET METAL FLASHING AND TRIM

1 PART 1 GENERAL

1.1 SUMMARY

A. Section includes flashings and counterflashings, gutters and downspouts, and fabricated sheet metal items.
   1. Provide precast concrete splash pads.

1.2 SYSTEM DESCRIPTION

A. Sheet Metal System: Conform to criteria of SMACNA "Architectural Sheet Metal Manual."

   1. Gutters and Downspouts: Size components for rainfall intensity determined by storm occurrence of 1 in 5 years in accordance with SMACNA recommendations.

1.3 SUBMITTALS

A. Samples: Submit two samples of each type of material, color, and finish.

1.4 WARRANTY

A. Furnish five year manufacturer warranty for finishes.

2 PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM

A. Product Description: Flashing and sheet metal; unfinished or prefinished, including gutters, downspouts, splash pads and accessories.

2.2 COMPONENTS

A. Pre-Finished Aluminum Sheet: Manufacturer’s standard alloy and temper for specified finish; plain finish shop pre-coated with modified silicone, acrylic or polyester PVDF (polyvinylidene fluoride) coating; color as selected from manufacturer's standard to match trim.

2.3 ACCESSORIES

A. Fasteners: Galvanized steel same material and finish as flashing metal, with soft neoprene washers.

B. Gutter and Downspout Anchorage Devices: Type recommended by fabricator.

C. Gutter Supports: Brackets.

D. Downspout Supports: Brackets.

E. Underlayment: No. 15 asphalt saturated roofing felt.

F. Protective Backing Paint: Zinc molybdate alkyd.

G. Slip Sheet: Rosin sized building paper.

H. Sealant: Exterior metal lap joint butyl or polyisobutylene sealant as specified in Section 07900.

I. Plastic Cement: ASTM D4586, Type I.

J. Primer and Solvent for Polyvinyl Chloride (PVC): As recommended by manufacturer.

2.4 FABRICATION

A. Gutter Accessories: Profiled to suit gutters and downspouts.

2.5 SHOP FINISHING

A. Acrylic Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system

***** [OR] ******

B. PVDF (Polyvinylidene Fluoride) Coating: High Performance Organic Finish, AAMA 2604 or 2605; multiple coat, thermally cured fluoropolymer finish system.

C. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system as recommended by finish system manufacturer.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

B. Verify membrane termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to minimum dry film thickness of 15 mil (0.4 mm).

3.3 INSTALLATION

A. Install starter and edge strips, and cleats.

B. Secure flashings, gutters and downspouts in place using [concealed] fasteners.

C. Apply plastic cement compound between metal work and felt flashings.

D. Fit components tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Slope gutters 1/4 inch per foot (20 mm/m) minimum.

F. Set splash pads under downspouts.

G. Seal joints watertight.

H. Install rain diverters as indicated on Drawings.

…END OF SECTION

SECTION 07900

JOINT SEALERS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Sealants and joint backing.

1.3 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, color availability .

1.4 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

2 PART 2 PRODUCTS

2.1 SEALANTS

A. Type A - General Purpose Exterior Sealant: Polyurethane ; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single or multi- component.

1. Color as selected.
2. Applications: Use for:

a. Joints between concrete and other materials.
b. Joints between metal frames and other materials.
c. Joints between siding and other materials.
d. Other exterior joints for which no other sealant is indicated.

B. Type B - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, non-skinning, non-curing.

1. Applications: Use for:

a. Concealed sealant bead in sheet metal work.
b. Bedding for door thresholds.

C. Type C - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.

1. Colors as selected.
2. Applications: Use for:

a. Interior wall and ceiling control joints.
b. Joints between door and window frames and wall surfaces.
c. Other interior joints for which no other type of sealant is indicated.

D. Type D - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.

1. Applications: Use for:

a. Joints between plumbing fixtures and floor and wall surfaces.
b. Joints between kitchen and bath countertops and wall surfaces.

E. Type E - Acoustical Sealant: Butyl or acrylic sealant; ASTM C920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.

1. Applications: Use for concealed locations only:

a. Sealant bead between top stud plate and structure and between bottom stud plate and floor.

F. Type F - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C920, Grade P, Class 25, Uses T, M and A; single or multi- component.

1. Colors as selected.
2. Applications: Use for:

a. Expansion joints in floors.

G. Type G - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, M and A; single or multi- component.

1. Color as selected.
2. Applications: Use for:

a. Joints in sidewalks and vehicular paving.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant D1667, closed cell PVC oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate surfaces and joint openings are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

C. Remove loose materials and foreign matter which might impair adhesion of sealant.

D. Clean and prime joints in accordance with manufacturer's instructions.

E. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

3.2 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

…END OF SECTION

Part II
Division 8

Doors and Windows

SECTION 08110

STEEL DOORS AND FRAMES

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Steel doors panels and frames; non-rated and fire rated

1.3 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, cut-outs for glazing, and finishes.

B. Product Data: Indicate door and frame configurations, location of cut-outs for hardware reinforcement.

1.4 QUALITY ASSURANCE

A. Conform to the following:

1. SDI-100 - Standard Steel Doors and Frames.
2. DHI - Door Hardware Institute - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
3. Fire Rated Door Panel and Frame Construction: ASTM E152. NFPA 252. UL 10B. NFPA 80.
4. Handicapped: ANSI A117.1, ADA.

2 PART 2 PRODUCTS

2.1 DOORS AND FRAMES

A. Manufacturers:

1. Brockway Smith Co.; BROSCO Perma-Door Royal.
2. General Products Co. Inc.; Benchmark
3. Lake Shore Industries Inc.; Therma-Tru
4. Peachtree Doors Inc.; Avanti.
5. Pease Doors Inc.; Ever-Strait.
6. Stanley Works.

B. Exterior Frames: Clear solid pine with integral flat pine casings and threshold.

C. Interior Frames: Adjustable 18 gage steel frames with wood casings.

D. Door Faces: 24 gage hot dipped galvanized steel.

E. Door Core: polyurethane foam.

F. Thermal Insulated Door: Total insulation R value of 10.

2.2 ACCESSORIES

A. Lights: Tempered insulating glass.

B. Silencers: Resilient rubber fitted into drilled hole.

C. Weatherstripping; Integral compression type at jambs and head, bulb and fin at bottom.

D. Primer: Zinc chromate type.

2.3 FABRICATION - DOORS

A. Astragals for Double Doors: Aluminum, T shaped, specifically for double doors.

B. Fabricate doors with hardware reinforcement welded in place.

C. Attach appropriate label to each fire rated door.

2.4 FABRICATION - FRAMES

A. Fabricate steel frames knock-down for field assembly. .

B. Fabricate wood frames fully assembled with prehung doors.

C. Fabricate frames with hardware reinforcement plates welded in place.

D. Prepare frame for silencers and install.

E. Attach appropriate label to each fire rated frame.

2.5 FINISH

A. Steel Sheet: Galvanized to ASTM A525 G60).

B. Primer: Air dried.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors and frames in accordance with SDI-100.

B. Coordinate installation of doors and frames with installation of hardware specified in Section 08705.

C. Coordinate with gypsum board wall construction for frame anchor placement.

D. Install door louvers plumb and level.

3.2 TOLERANCES

A. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

…END OF SECTION

SECTION 08210

WOOD DOORS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Wood doors and frames, non-rated.

1.3 SUBMITTALS

A. Shop Drawings: Indicate door elevations.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the following:

1. NWWDA I.S.1.

1.5 WARRANTY

A. Section 01001 - Basic Requirements: Provide a five year warranty to include coverage:

1. Interior Doors: Five (5) years.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction.

2 PART 2 PRODUCTS

2.1 DOOR TYPES

A. Manufacturers:

1. Blount Lumber Co.
2. Brockway Smith Co.
3. Jeld-Wen Inc.
4. Mohawk Flush Doors Inc.

B. Interior Doors: 1-3/8 inches thick; hollow core construction; as indicated.

2.2 DOOR CONSTRUCTION

A. Core (Hollow): NWWDA, mesh or cellular core including lock blocks, vertical edge bands, and top and bottom rails.

2.3 DOOR FACING

A. Face Panel: Hardboard, smooth, embossed with six panel design two sides, 1/8 inch thick.

B. Adhesive: NWWDA, Type I.

2.4 FRAMES

A. Interior Door Frames: Split jamb wood frames suitable for paint finish with BROSCO 8710 casings both sides.

2.5 FABRICATION

A. Fabricate non-rated doors in accordance with NWWDA I.S.1 requirements.

B. Fabricate doors with hardware reinforcement blocking in place.

C. Factory machine doors for finish hardware.

D. Factory fit doors for frame opening dimensions identified on shop drawings.

2.6 FINISH

A. Finish doors in accordance with Section 09900 – Painting.

B. Seal door top and bottom edge with paint finish to match door facing.

3 PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions NWWDA I.S.1 requirements.

B. Coordinate installation of doors with installation of hardware specified in Section 08710.

C. Adjust door for smooth and balanced door movement.

3.2 INSTALLATION TOLERANCES

A. Conform to NWWDA requirements for fit and clearance tolerances and maximum diagonal distortion.

B. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

…END OF SECTION

SECTION 08550
WOOD WINDOWS

PART 1 GENERAL

SUMMARY

A. Section Includes: Vinyl Clad Double-Hung Tilt in and Awning Wood Windows.

B. Related Sections:

Division 6 Section: Finish Carpentry.

Division 9 Section: Gypsum Drywall.

Division 7 Section: Sealants.

Division 7 Section: Thermal Insulation.

REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American National Standards Institute (ANSI):

ANSI/AAMA/NWWDA 101/I.S.2 Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

C. ASTM International:

ASTM C1036 Standard Specification for Flat Glass.

ASTM C1048 Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.

ASTM D3656 Standard Specification for Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.

ASTM D4216 Standard Specification For Rigid Poly (Vinyl Chloride) (PVC) And Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds.

ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. Insulating Glass Certification Council (IGCC):

Requirements for Class CBA.

E. Insulating Glass Manufacturers Association of Canada (IGMAC):

Requirements for CAN/CGSB 12.8.

F. National Institute of Standards and Technology (NIST):

Voluntary Product Standard PS1.

G. National Fenestration Rating Council (NFRC):

NFRC 100 Procedure for Determining Fenestration Product Thermal Properties.

NFRC 200 Procedure for Determining Solar Heat Gain Coefficient.

H. Window and Door Manufacturers Association (WDMA), (formerly National Wood Window & Door

Association (NWWDA)):

WDMA Industry Standard I.S.4 Industry Standard for Water-Repellent Preservative Non-Pressure Treated for Millwork.

SYSTEM DESCRIPTION

A. Performance Requirements: Provide products/systems that have been manufactured, fabricated and installed to the following performance criteria:

Test to ANSI/AAMA/NWWDA 101/I.S.2.

a. Performance Grade: [Specify performance grade.].

U-Factor (NFRC 100): [Specify U-Factor.].

Solar Heat Gain Coefficient (SHGC) (NFRC 200): [Specify SHGC.].

Outdoor Indoor Transmission Class (OITC) (ASTM E90): [Specify OITC.].

Sound Transmission Class (STC) (ASTM E90): [Specify STC.].

SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data and installation instructions.

C. Shop Drawings: Provide drawings indicating direction of operable parts, typical jamb, head and sill conditions and special mullion reinforcement details.

D. Samples: Submit selection and verification samples, including the following:

Hardware: Submit sample indicating typical finish on hardware.

Vinyl Cladding: Submit color samples of exterior cladding.

E. Quality Assurance/Control Submittals: Submit the following:

Performance Data: Provide manufacturer's published performance data for specified products.

F. Closeout Submittals: Submit the following:

Warranty documents specified herein.

Owner's Manual: Bound manual clearly identified with project name, location and completion date. Identify type and size of [Window] [And] [Door] units installed. Provide recommendations for periodic inspections, care and maintenance. Identify common causes of damage with instructions for temporary repair.

QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

B. Regulatory Requirements and Approvals: [Specify applicable requirements of regulatory agencies.].

C. Certifications: [Specify requirement for certifications.].

Insulating Glass Units: Provide insulating glass units permanently marked with certification label of [Insulating Glass Certification Council (IGCC) indicating compliance with Class CBA] [Insulating Glass Manufacturers Association of Canada (IGMAC) and conforming to the requirements of Canadian General Standards Board specification CAN/CGSB 12.8].

DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

Store [Doors] [And] [Windows] and accessories off ground, under cover, protected from weather and construction activities.

PROJECT/SITE CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurement before fabrication. Record measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

B. Install [Doors] [And] [Windows] in strict accordance with manufacturer's safety and weather recommendations.

WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard limited warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

PART 2 PRODUCTS

WOOD WINDOWS

A. Manufacturer: Andersen Corporation.

B. Proprietary Products/Systems. Vinyl clad double-hung tilting wood windows, including the following:

Andersen 200 Series Tilt-Wash Double-Hung Windows, pre-finished interior, white.

Andersen 400 Series Awning Windows, pre-finished interior, white.

PRODUCT SUBSTITUTIONS

A. Substitutions: No substitutions permitted.

MATERIALS

A. Frame and Sash: Fabricated from wood species approved in WDMA Industry Standard I.S.2 and treated according to WDMA I.S.4.

B. Vinyl Cladding: Rigid vinyl (PVC). Comply with requirements of ASTM D4216.

Color: White.

C. Weatherstripping:

Double-Hung Horizontal Weatherstripping: Weatherstripping at head jamb consists of a flexible PVC leaf and bulb. Weatherstripping at check rail interlock consists of a flexible PVC bulb. Gasket type covered foam between bottom rail and sill cover.

Double-Hung Unit Vertical Weatherstripping: Compressible PVC profiles installed in side jamb liners contacting sash edges with flexible fin assisting contact along lower sash edges. Provide fin-pile plug attached to jamb liner at check rail area of side jamb between sash runs. Seal lower jamb liner with 2 silicone closed cell

foam plugs.

Venting Sash: Weatherstripped with [Tubular flexible vinyl] [Flexible EPDM foam].

D. Hardware:

Double-Hung Window Hardware:

a. Sash Locks and Keepers: Cam-operated injection molded glass reinforced polyester sash locks with integral color: [Standard stone finish] [White].

b. Balances: Fit top and bottom sash with concealed sash mounted balances consisting of spring power with block and tackle. Design balances to ensure easy operation of double-hung units.

Awning Hardware:

a. Operator: Rotary type operator attached to a plated steel rod applied to bottom rail of sash. A single steel operator arm stamped with a gear ring. Set arm gear assembly between nylon bushing and nylon spacer. Encase drive shaft and worm gear assembly in zinc diecast housing base.

b. Operator Handle and Covers: [Classic™ Series hardware; zinc diecast Easy grip style handle with powder coated painted finish in and polycarbonate operator cover with integral color in White finish.

c. Sash Locks: Single actuation lock concealed by trim stops. Diecast zinc, galvanized steel link and engineered polymer components.

d. Hinges: Stainless steel hinges with steel reinforced, sliding nylon shoes. Apply hinges to venting sash indicated on drawings.

e. Corrosion Resistant Hardware: Hinges with 316 stainless steel arms, rivets, track, screws and shoe insert. Operator with 302 stainless steel gear arm rivet, bottom plate Zn-Co plated steel; all other parts plated and powder coated steel or zinc.

GLAZING

A. General: Insulating glass units certified through the Insulating Glass Certification Council and conforming to the requirements of [IGCC Class CBA] [Insulating Glass Manufacturers Association of Canada (IGMAC) conforming to the requirements of Canadian General Standards Board CAN/CGSB 12.8]. Provide dual sealed units consisting of polyisobutylene primary seal and silicone secondary seal. Metal spacers to have bent corners.

B. Low-E, Argon Blend Filled Insulating Glass Units:

[Low-E insulating glass units to consist of an outboard lite of clear annealed glass conforming to ASTM C1036, Type 1, Class 1, q3 and an inboard lite of clear, heat strengthened glass conforming to ASTM C1048, Type 1, Class 1, q3, Kind HS] [Tempered Low-E insulating glass units to consist of 2 layers of clear tempered glass conforming to ASTM C1048, Type 1, Class 1, q3, Kind FT].

Low-E Coating: Magnetron sputtering vapor deposition (MSVD) Low-E coating applied to the No. 2 surface.

Filling: Fill space between glass lites with argon gas blend.

JOINING SYSTEMS

A. Joining Systems: 1-way combination only.

Narrow Wood Joining: Machined LVL wood members treated with water repellent preservative after machining in accordance with WDMA I.S.4.

Gusset Plates: Galvanized steel plates that attach to wood frame.

Exterior Trim Strips: As recommended by window manufacturer for each joining method used. Color to match window unit exterior color.

ACCESSORIES

A. Finelight™ Grilles: Provide 3/4 inch (19 mm) wide contour profile aluminum muntin bars permanently mounted within the insulated glass unit where indicated on Drawings. Grille intersections to be ABS concealed plastic connectors with nylon end keepers.

B. Extension Jambs:

Unfinished wood members machined from clear material or veneered finger-jointed material approved in ANSI/AAMA/NWWDA 101/I.S.2. Predrill extension jambs for application.] or [White 0.008 inch (0.2 mm) vinyl wrapped wood.

C. Support Mullion Trim: Provide 2 inch (51 mm) wide wood filler and vinyl trim strip where indicated on Drawings.

Treat wood members with water repellent preservative after machining in accordance with WDMA I.S.4.

Provide exterior vinyl trim strip. Color to match window exterior.

Provide 6 inch (200 mm) long sheet vinyl head flashing. Color to match window exterior at mullion head.

D. Insect Screens: Provide venting sash with an insect screen, including attachment hardware.

Frames: 0.024 inch (0.61 mm) rolled aluminum frame with chromate conversion coating. Provide matching corner locks and latch retainers.

Insect Screen Cloth: 18 × 16 fiberglass mesh, black finish. Conform to ASTM D3656.

Frame Finish: High-bake polyester finish. Color: [White] [Sandtone].

E. Sash Lifts: Injection molded PVC composite. Color: [White] [Stone].

FABRICATION

A. Preservative Treatment: Treat wood frame members and interior glazing stops after machining with a water repellent preservative in accordance with WDMA I.S.4.

B. Vinyl Cladding: Frame Units: Sheath frame units with preformed rigid vinyl to provide a joint-free cover. Vinyl sheathing to have 0.035 inch (0.89 mm) integral flanges for installation. Bond sheathing to wood frame with vinyl-to-wood adhesive.

C. Jamb and Head Liners:

Hung Units: Provide 0.045 inch (1.14 mm) thick, rigid vinyl side jamb and head jamb liner extrusions secured to jamb assembly.

D. Sash: Treat sash members with a preservative, water repellent, conductive solution in accordance with WDMA I.S.4.

Stabilizer Coating: Apply minimum 1.5 mil dry thickness stabilizer to all surfaces to be topcoated.

Finish Coating: Apply minimum 1.5 mil dry thickness Flexacron® finish coat over stabilized exterior and interior surfaces.

Glazing: Factory glaze with high quality glazing silicone sealant and snap-in rigid

vinyl glazing bead.

E. Factory apply weatherstripping.

PART 3 EXECUTION

MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the window manufacturer.

EXAMINATION

A. Site Verification of Conditions:

Verify that site conditions are acceptable for installation of Windows, including the following:

a. Concrete surfaces are dry and free of excess mortar, rocks, sand and other construction debris.

b. Rough opening or masonry opening is square and dimensions are correct.

c. Sill plates are level.

d. Wood frame walls are dry, clean, sound and well nailed, and/or glued, free of voids and without offsets at joints.

e. Nail heads are driven flush with all surfaces in opening and within 3 inches (75 mm) of rough opening.

Do not proceed with installation of [Windows] [And] [Doors] until unacceptable conditions are corrected.

INSTALLATION

A. Techniques:

Remove window components, parts, accessories and installation guides from carton.

Inspect window components and verify that components are not damaged and that all parts are included before disposing of carton.

Shop assemble multiple units before installation in accordance with manufacturer's installation guides.

B. Interface with Other Work:

Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support and in proper relation to wall flashing and other adjacent construction.

Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

Install insulation in shim space around window perimeter to maintain continuity of building insulation. Do not overfill.

Hold back exterior siding or other finish materials from edge of [Window] [And] [Door] to allow for expansion and contraction and the installation of a proper sealant joint with backing materials. Seal perimeter of window after exterior finish is applied in accordance with the requirements of related section.

Finish interior [Window] [And] [Door] components according to requirements specified in related sections. Refer to, and comply with, additional requirements in manufacturer's installation guides.

Install optional hardware and unit accessories after cleaning.

C. Site Tolerances: [Specify allowable variation.].

Adjust operating sashes and ventilators, screens, hardware and accessories for a tight fit at contact points and weatherstripping for smooth operation and weathertight closure.

CLEANING

A. Clean window surfaces immediately after installation using cleaning materials and methods specifically recommended by window manufacturer.

Remove excess sealants, glazing materials, dirt and other substances.

Avoid damaging protective coatings and finishes.

B. Protect window surfaces from masonry cleaning solutions that could damage insulating glass panels or hardware.

C. Remove debris from work site and properly dispose of debris.

PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 08631

TUBULAR PLASTIC WINDOWS

1 PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory fabricated tubular extruded plastic windows with operating sashes.

B. Glass factory glazed, and framed insect screens.

1.2 SYSTEM DESCRIPTION

A. Windows: Extruded tubular plastic sections, factory fabricated, vision glass, related flashings, anchorage and attachment devices.

B. Performance Requirements For Windows: Conform to ANSI/AAMA 101V Grade 40.

C. System Design: Performance to provide for expansion and contraction within system components caused by temperature cycling. Design and size members to withstand dead loads caused by pressure and suction of wind.

D. Air Infiltration: Limit air leakage through assembly to 0.03 cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with AAMA 501.

E. Water Leakage: None, when measured in accordance with ASTM E331.

F. Uniform Structural Load: No damage at 82.5 psf.

G. Condensation Resistance Factor: 58 when tested in accordance with AAMA 1504.

H. System Internal Drainage: Drain water entering the framing system, to exterior.

I. Thermal Movement: Design sections to permit thermal expansion and contraction of plastic as compared to glass, infill, or perimeter opening construction.

1.3 SUBMITTALS

A. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details and screens.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work and installation requirements.

1.4 WARRANTY

A. Section 01001 - Basic Requirements: Provide a ten year warranty to include coverage for insulated glass units.

2 PART 2 PRODUCTS

2.1 WINDOW UNITS

A. Window Unit Manufacturers:
   1. Paradigm Windows, Portland, Maine.

B. Frames: 3-1/4” deep profile.

C. Configuration: single hung and awning units.

D. Model: Standard

2.2 FRAME MATERIALS AND ACCESSORIES

A. Plastic: hollow tubular sections of extruded 100% virgin polyvinyl chloride (PVC) with nominal wall thickness of 0.065”.

B. Fasteners: Stainless steel.

C. Sills: Extruded tubular plastic; sloped for positive wash; extend 1 inch beyond wall face; one piece full width of opening.

D. Insect Screen Frames: Extruded aluminum , of rectangular sections with aluminum 18 x 16 mesh set into frame and secured. Fit frames with adjustable roller hardware.

E. Weather Stripping: Minimum of two courses of solid barrier fin-type at crack perimeter with flexible bulb type at bottom sash, configured for flexible fit.

F. Sealant and Backing Materials: As specified in Section 07900 .

G. Anchor Devices: Stainless steel.

H. Casing: 1” vinyl receiver casing.

J. Grills: Integral between glass as indicated.

2.3 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials in Window Lights: 7/8” Low-E insulating glass.

2.4 HARDWARE

A. Single Sash: Block and tackle balance, each sash, each jamb.

B. Sash lock: Lever handle with cam lock

2.5 FABRICATION

A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.

B. Form snap in glass stops, closure molds, weather stops, and flashings of extruded PVC for tight fit into window frame section. Form weather stop flange to perimeter of unit.

C. Assemble insect screens of formed aluminum rectangular sections with mesh set into frame and secured.

D. Double weatherstrip operable units.

2.6 FINISHES

A. Exterior Surfaces: White color.

B. Interior Surfaces: White color .

C. Screens: Black color .

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that rough openings are correctly sized and located.

B. Prepare opening to permit correct installation of frame and achieve continuity of air and vapor barrier seal.

3.2 INSTALLATION

A. Install window units, in accordance with manufacturers instructions.

B. Use anchorage devices to securely attach frames to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor barrier materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Install perimeter sealant, backing materials, and installation requirements in accordance with Section 07900

…END OF SECTION

SECTION 08705

DOOR HARDWARE

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SUMMARY

A. Hardware for wood, hollow steel, doors.

B. Thresholds, weatherstripping, seals, and door gaskets.

1.3 SUBMITTALS

A. Hardware Schedule: Indicate hardware components in sets correlated to door schedule.

B. Product Data: Submit data for hardware components illustrating style, operating features, color, and finish.

C. Operating and Maintenance Instructions: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.4 QUALITY ASSURANCE

A. Hardware Supplier: Company specializing in supplying commercial door hardware with 5 years documented experience approved by manufacturer.

1.5 COORDINATION

A. Coordinate work of this section with other directly affected sections requiring any integral reinforcement for door hardware.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually. Label and identify package with door opening code to match schedule.

B. Deliver keys to Owner.

1.7 MAINTENANCE

A. Provide manufacturer's maintenance services on door closers and locksets for one year from Date of Substantial Completion.

B. Provide special wrenches and tools applicable to each different or special hardware component.

2 PART 2 PRODUCTS

2.1 SUPPLIERS

A. Suppliers: Products of one or more manufacturers are listed in the Hardware Schedule to establish quality and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.

1. Manufacturers of Locksets:

    a. Corbin
    b. Sargent.
    c. Schlage.
    d. Yale.

2. Manufacturers of closers:

    a. Dorma.
    b. LCN.
    c. Norton.
    d. Rixson.
    e. Sargent.
    f. Yale.

3. Manufacturers of hinges:

    a. Hager.
    b. Stanley.

4. Manufacturers of thresholds and weatherstripping.

    a. National Guard Products.
    b. Pemko.
    c. Reese.
    d. Zero.

5. Manufacturers of panic sets:

    a. Dorma.
    b. Sargent.
    c. Von Duprin.
    d. Yale.

6. Manufacturers of door trim and accessories:

    a. Hiawatha.
    b. Ives.
    c. Rockwood.

2.2 KEYING

A. Door Locks: Master keyed. Include construction keying.

B. Supply 3 change keys for each lock and 5 master keys, each tagged. Provide keys of nickel silver only.

C. Key Cabinet: Sheet steel construction, enamelled finish, hinged door with key lock, internal hooks for 25 keys, identification labeling.

2.3 MATERIALS AND FABRICATION

A. Provide products complying with ANSI A 156.1 standards.

B. Name Plates: Do not provide products with manufacturers name or trade name displayed in a visible location except in conjunction with required UL labels.

C. Provide hardware manufactured to conform to templates with machine screw installation. Do not provide hardware prepared for self-tapping screws.

D. Fasteners: Provide Phillips flat head screws except as otherwise indicated. Finish screws to match adjacent hardware finish.

E. Lever Handles: Provide lever handles at all doors required to be accessible to the handicapped.

2.4 FINISHES

A. Finishes are identified in Schedule at end of this section.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that doors and frames are ready to receive work and dimensions are as instructed by the manufacturer.

B. Verify that electric power is available to power operated devices and is of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions.

B. Install hardware at fire rated doors in accordance with NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Adjust hardware and door control devices to comply with ADA requirements.

…END OF SECTION

Logan Place
Portland, Maine
Hardware Schedule

Item/function	Manufacturer	Model No.	Finish	Remarks
Lockset 1	Schlage	D50PD RHO	626	Public
Lockset 2	Schlage	D53PD SAT	626	Residence
Storeroom 1	Schlage	D80PD RHO	626	Storeroom Lock
Storeroom 2	Schlage	D70PD RHO	626	Classroom Lock
Privacy 1	Schlage	D40S RHO	626	Public
Privacy 2	Schlage	F40N FLA	626	Residence Privacy
Passage 1	Schlage	D10S RHO	626	Public Passage
Passage 2	Schlage	F10N FLA	626	Residence Passage
Vestibule 1	Schlage	D60PD RHO	626	Public
Dummy Trim 1	Schlage	F17ON FLA	626	Single Dummy Trim, One Per Door Leaf
Class Room 1	Schlage	D70PD RHO	626	Public Classroom
Closer	Dorma	7600	626	ADA compliant
Threshold	National Guard	425	Alum	ADA compliant - maximum 1/2" height
Hinges	Hager	Full mortise	626	Provide ball bearing hinges at doors with closers.
Floor Stop	Ives	436	Alum	
Wall Stop	Ives	406 1/2	Alum	
Roller Bumber	Ives	471	Alum	
Kickplate	Ives	8400	St Steel	
Door Operator 1[1]	Sargent	2600 Series	262	Pushside Mount, Paddle switch Model # 4298 to activate electric strike and door operator
Door Operator 2[1]	Sargent	2600 Series	626	Pushside Mount, Cylinder Key switch - Model # 4370 to activate electric strike and door operator
Spring Hinges	Stanley	RD2060R	626	1 1/2 Pairs - Provide spring hinges required for door operation
Magnetic Latch	Stanley	SP45	Alum	Mount @ Door head, 1 Per Door Leaf
One Way Viewer	Ives	696	B4-B26D	Provide one at each unit entry door at 60" aff except HC Units at 48" and 60".
Electric Strike [1]	Schlage	10-201 Eu series	630	Apartment Unit Electric Strike
Magnetic Lock [1]	Sargent	1584	32D	Provide fail safe operation & audible notification at check in desk if door remains open for an extended period. Cylinder key model #4320 to unlock magnetic lock.

Notes

[1] Coordinate voltage of electric strikes and door openers with intercom system. Provide transformers as required to line voltage power by electric contractor.

Provide masterkey system, with construction keying system. Consult with Owner for instructions on keying.

Products of one or more manufacturers are listed to establish quality and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.

Acceptable Manufacturers

Locksets:	Sargent, Schlage, Corbin, Yale
Closers:	Sargent, Dorma, LCN, Norton, Rixson, Yale
Hinges:	Hager, Stanley
Thresholds:	National Guard Products, Pemko, Reese, Zero

Island View Apartments

Portland, Maine

Window Schedule

New No.	Window Manufactuer	Unit Type	Quantity (8)	Unit Width	Unit Height	Required Egress	Low "E" Insul-Glass (5)	Insect Screen	Pre-finished Grills Inside Glass	Pntd. GWB Return Jamb+Head	Pntd. Wood Sill+Apron (6)
Building A											
A		Single Hung Pair	68	(2) 3'-0"	4'-6"		Yes	Yes	Top 6/1	Yes	Yes
B		Single Hung	156	3'-0"	4'-6"		Yes	Yes	Top 6/1	Yes	Yes
C		Fixed	6	2'-4"	3'-6"		Yes		6	Yes	Yes
D		Fixed	4	(4) 2'-0" qtr-round			Yes		4	Yes	
C'		Fixed	1	3'-0"	3'-0"						
Building B											
E		Single Hung Pair	72	(2) 3'-0"	4'-9"	Yes	Yes	Yes	Top 6/1	Yes	Yes
F		Single Hung	76	2'-4"	3'-6"		Yes	Yes	Top 6/1	Yes	Yes

Island View Apartments

Portland, Maine

Window Schedule

New No.	Window Manufactuer	Unit Type	Quantity (8)	Unit Width	Unit Height	Required Egress	Low "E" Insul-Glass (5)	Insect Screen	Pre-finished Grills Inside Glass	Pntd. GWB Return Jamb+Head	Pntd. Wood Sill+Apron (6)
G		Single Hung	12	2'-0"	3'-6"		Yes	Yes	Top 4/1	Yes	Yes
H		Single Hung	4	3'-0"	4'-9"	Yes	Yes	Yes	Top 8/1	Yes	Yes
K		Single Hung	4	3'-0"	3'-6"		Yes	Yes	Top 8/1	Yes	Yes
L		Single Hung	4	2'-4"	5'-0"		Yes		Top 6/1	Yes	
M		Fixed	4	2'-4" half-round			Yes		4	Yes	
N		Fixed	4	2'-4"	3'-6"		Yes		8	Yes	Yes

1. Alternate Manufactuers: By architect approval only.
2. Verify Rough Openings Prior to Framing
3. Insulate Between Window and Rough Opening w/ expandable polystyrene insulation.
4. Provide Safety Glazing as Required by CPSC Regulations.
5. Provide Insulated Glazing throughout.
6. Brosco 8710 Apron w/ 5/4x Sill.
7. Provide blinds at all windows except in common areas.
8. Contractor shall verify all quanities.
9. All window units shall meet or exceed the design pressure requirements to BOCA 1999, Section 1609 Wind Loads.

Note: Sliding patio door specs on door schedule.

Logan Place

Portland, Maine

Window Schedule (ALTERNATE # 1)

No.	Window Manufactuer	Unit Type	Model No.	Unit Width	Unit Height	Required Egress	Low "E" Insul-Glass (5)	Insect Screen	Pre-finished Grills Inside Glass	Pntd. GWB Return Jamb+Head	Pntd. Wood Sill+Apron (6)	Vinyl "J" Trim to Match Siding Color
A	Andersen	200 Series Double Hung	(2)244DH3056	(2) 3'-0"	5'-6"	Yes	Yes	Yes	Top	Yes	Yes	Yes
B	Andersen	200 Series Double Hung	224DH3056	3'-0"	5'-6"	Yes	Yes	Yes	Top	Yes	Yes	Yes
C	Andersen	400 Series Awning	P3030	3'-0"	3'-0"	No	Yes	Yes	Yes	Yes	Yes	Yes
D	Andersen	400 Series Awning	P4040	4'-0"	4'-0"	No	Yes	Yes	Yes	Yes	Yes	Yes
E	Andersen	200 Series Double Hung	(2)244DH3050	(2) 3'-0"	5'-0"	Yes	Yes	Yes	Top	Yes	Yes	Yes

1. Alternate Manufactuers:
2. Verify Rough Openings Prior to Framing
3. Insulate Between Window and Rough Opening as recommended by window manufacturer.
4. Provide Safety Glazing as Required by CPSC Regulations.
5. Provide Insulated Glazing throughout.
6. Brosco 8710 Apron w/ 5/4x Sill.

Logan Place
Portland, Maine
Hardware Schedule

Item/function	Manufacturer	Model No.	Finish	Remarks
Lockset 1	Schlage	D50PD RHO	626	Public
Lockset 2	Schlage	D53PD SAT	626	Residence
Storeroom 1	Schlage	D80PD RHO	626	Storeroom Lock
Storeroom 2	Schlage	D70PD RHO	626	Classroom Lock
Privacy 1	Schlage	D40S RHO	626	Public
Privacy 2	Schlage	F40N FLA	626	Residence Privacy
Passage 1	Schlage	D10S RHO	626	Public Passage
Passage 2	Schlage	F10N FLA	626	Residence Passage
Vestibule 1	Schlage	D60PD RHO	626	Public
Dummy Trim 1	Schlage	F17ON FLA	626	Single Dummy Trim, One Per Door Leaf
Class Room 1	Schlage	D70PD RHO	626	Public Classroom
Closer	Dorma	7600	626	ADA compliant
Threshold	National Guard	425	Alum	ADA compliant - maximum 1/2" height
Hinges	Hager	Full mortise	626	Provide ball bearing hinges at doors with closers.
Floor Stop	Ives	436	Alum	
Wall Stop	Ives	406 1/2	Alum	
Roller Bumber	Ives	471	Alum	
Kickplate	Ives	8400	St Steel	
Door Operator 1[1]	Sargent	2600 Series	262	Pushside Mount, Paddle switch Model # 4298 to activate electric strike and door operator
Door Operator 2[1]	Sargent	2600 Series	626	Pushside Mount, Cylinder Key switch - Model # 4370 to activate electric strike and door operator
Spring Hinges	Stanley	RD2060R	626	1 1/2 Pairs - Provide spring hinges required for door operation
Magnetic Latch	Stanley	SP45	Alum	Mount @ Door head, 1 Per Door Leaf
One Way Viewer	Ives	696	B4-B26D	Provide one at each unit entry door at 60" aff except HC Units at 48" and 60".
Electric Strike [1]	Schlage	10-201 Eu series	630	Apartment Unit Electric Strike
Magnetic Lock [1]	Sargent	1584	32D	Provide fail safe operation & audible notification at check in desk if door remains open for an extended period. Cylinder key model #4320 to unlock magnetic lock.

Notes

[1] Coordinate voltage of electric strikes and door openers with intercom system. Provide transformers as required to line voltage power by electric contractor.

Provide masterkey system, with construction keying system. Consult with Owner for instructions on keying.

Products of one or more manufacturers are listed to establish quality and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.

Acceptable Manufacturers

Locksets:	Sargent, Schlage, Corbin, Yale
Closers:	Sargent, Dorma, LCN, Norton, Rixson, Yale
Hinges:	Hager, Stanley
Thresholds:	National Guard Products, Pemko, Reese, Zero

Part II
Division 9

Finishes

SECTION 09260

GYPSUM BOARD SYSTEMS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SUMMARY

A. Gypsum board with joint treatment.

B. Metal channel wall and ceiling framing.

C. Acoustic insulation.

1.3 SYSTEM DESCRIPTION

A. Conform to applicable code for fire rated assemblies and as follows:

1. Fire Rated Partitions: Listed assembly by UL.

1.4 SUBMITTALS

A. Product Data: Submit data on gypsum board products and accessories.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840. GA-201 - Gypsum Board for Walls and Ceilings. GA-214 - Recommended Specification: Levels of Gypsum Board Finish. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board. GA-600 - Fire Resistance Design Manual.

2 PART 2 PRODUCTS

2.1 GYPSUM BOARD SYSTEM

A. Manufacturers:

1. Domtar Gypsum Co.
2. Georgia Pacific Corp.
3. Gold Bond Building Products /Div. National Gypsum Co.
4. United States Gypsum Co.

B. Furring, Framing, and Accessories: ASTM C645. GA-216, and GA-600.

C. Gypsum Board Types: 5/8 inch thick, maximum available length in place; ends square cut, tapered edges; unless noted otherwise as follows:

1. Standard Type: ASTM C36
2. Fire Rated Type: ASTM C36 fire resistive, UL rated.
3. Moisture Resistant Type: ASTM C630
4. Abuse resistant type: ASTM36, E695

2.2 ACCESSORIES

A. Acoustic Insulation: ASTM C665, preformed mineral wool, friction fit type, unfaced, 2.5 inches thick.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

C. Corner Beads: Metal.

D. Edge Trim: GA-201 and GA-216, Type LC bead.

E. Joint Materials: ASTM C475 GA-201 and GA-216, reinforcing tape, joint compound, adhesive, and water.

F. Fasteners: ASTM C1002 Type S12 hardened screws.

G. Adhesive: ASTM C557.

3 PART 3 EXECUTION

3.1 INSTALLATION - ACOUSTIC ACCESSORIES

A. Install resilient channels at maximum 24 inches oc. Locate joints over framing members.

B. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

C. Install acoustic sealant within partitions in accordance with manufacturer's instructions.

3.2 INSTALLATION - GYPSUM BOARD

A. Install gypsum board in accordance with GA-201, GA-216, GA-600 and manufacturer's instructions.

B. Fasten gypsum board to furring or framing with screws.

C. Place control joints consistent with lines of building spaces as directed, spaced as recommended by manufacturer.

D. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

E. Seal cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.3 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes, minimum of three coats.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

C. Sanding and final coat of fill is not required at concealed surfaces above ceilings and in inaccessible spaces.

3.4 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

…END OF SECTION

SECTION 09510

ACOUSTICAL CEILINGS

1 PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Provide acoustical ceilings where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

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. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 20 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

1.5 EXTRA STOCK

A. Deliver to the Owner for his use in future modifications, an extra stock of 2 unopened boxes of each type of acoustic tile used.

2 PART 2 PRODUCTS

2.1 SUSPENSION SYSTEM

A. Provide a complete system of supporting members, anchors, wall cornices, adapters for light fixtures and grilles, and accessories of every type required for a complete suspended "T" grid system of the arrangements shown on the Drawings, in color or colors selected by the Architect from standard colors of the approved manufacturer, and complying with pertinent requirements of Underwriters Laboratories, Inc., and the governmental agencies having jurisdiction.

B. Acceptable Products:

1. Exposed tee grid 24 inch by 24 inch shall be Donn DX System as manufactured by USG Interiors, Inc., Chicago, IL or Chicago Metallic 200 Snap Grid, or approved equal. Components shall be formed from commercial quality cold-rolled steel, electro-galvanized coated and prepainted. Exposed finish shall be low sheen satin white.

2.2 ACOUSTICAL CEILING PANELS

A. Acceptable products:

1. Acoustic panels shall be U.S.G. “F” Fissured square-edge panels, fissured design, 24 inches by 24 inches by 5/8 inch, FIRECODE formulation, as manufactured by USG Interiors, Inc., Chicago, Illinois or equal.

2. All ceiling materials shall be 100% free of asbestos.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

3 PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION, GENERAL

A. Except as modified by requirements of governmental agencies having jurisdiction, recommendations of the manufacturer as approved by the Architect, or specific directions of the Architect, install in accordance with ASTM C636 and the pertinent UL design requirements.

B. Lateral Bracing:

1. Provide lateral bracing as required by pertinent codes and regulations.

2. Secure lateral bracing to structural members. Secure at right angles to the direction of the partition and four ways in large ceiling areas.

C. Provide hold-down clips for ceiling boards only when so required by governmental agencies having jurisdiction.

D. Make all grid level within a tolerance of one in 1000 and straight within a tolerance of one in 1000.

E. Install the suspension system in accordance with the layout indicated on drawings. Layout tile from center of areas in both directions, except where otherwise shown on Drawings. Provide proper openings for the installation of electrical fixtures, mechanical items, etc. Any field conditions interfering with the installation of the ceiling shall be called to the attention of the Architect for solution before proceeding with work.

F. Provide approved type inserts and fastenings as required for the suspension system.

G. Suspension system shall be of sufficient strength to support lighting fixtures, supply diffusers, return grilles, and acoustic panels with a maximum deflection of 1/360 of the span. All extra supports shall be provided wherever required to maintain alignment of suspension system due to installation of mechanical and electrical trade components.

H. Units abutting vertical surfaces shall be provided with metal wall molding.

3.3 INSTALLATION OF ACOUSTICAL MATERIALS

A. Suspension System Hangers - Fasten 12 gauge galvanized steel wire hangers to structural framing at not more than 3 feet apart for the length of main runners. Support of each hanger shall be a galvanized eye fitting fastened to structural support. Provide all supports for main tees.

B. Main Runners - Erect main runners 48" o.c. for exposed grid; loop hanger wire through wire support and secure by twisting on drop not less than 3 turns; lower end of hanger wire shall be looped through tab on main runner and secured by twisting on self not less than three turns. Provide extra wire and eye support in center of long dimension on each side of light or mechanical fixture.

C. Cross Tees - Insert cross tees 24" apart and secure to main runners. Cross tees shall not engage main runners at joints.

D. Borders - Install wall molding securely fastened to wall. Parallel borders shall be not less than 6" wide and equal.

E. Acoustical - Install 24" by 24" panels in exposed grid system, with pattern of all panels running parallel to short axis of room.

3.4 CLEANING AND FINISHING

A. Following erection and when directed by the Architect, clean all exposed surfaces of dirt, discoloration and all foreign substances. Units which are damaged or improperly installed shall be removed and replaced with whole new units as directed by the Architect, at no additional cost to the Owner.

B. Remove all cartons, containers, rubbish and waste materials from the premises as they accumulate or as required by the Architect.

…END OF SECTION

SECTION 09650

RESILIENT FLOORING

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Resilient sheet, tile flooring and base.

1.3 SYSTEM DESCRIPTION

A. Resilient Flooring: Conform to applicable code for flame/smoke rating requirements of 75/450 in accordance with ASTM E84 and critical radiant flux (CRF) of 0.45 per ASTM E648.

1.4 EXTRA MATERIAL

A. Provide 5% of resilient flooring of each type, color and pattern.

2 PART 2 PRODUCTS

2.1 TILE MATERIALS

A. Vinyl Composition Tile: ASTM F1066 FS SS-T-312B, Type IV

1. Size: 12 x 12 inch.
2. Thickness: 0.125 inch.
3. Pattern: Marbleized
4. Manufacturers:

    a. Armstrong World Industries Inc.
    b. Azrock Industries Inc.
    c. Kentile Floors Inc.
    d. Mannington Mills Inc.
    e. Tarkett Inc.

2.2 ACCESSORIES

A. Subfloor Filler: Type recommended by floor material manufacturer.

B. Primers and Adhesives: Waterproof, type recommended by floor material manufacturer.

C. Base: Vinyl top set coved :

1. Height: 4 inch.
2. Thickness: 0.080 inch thick.
3. Finish: Satin
4. Length: Roll.
5. Manufacturers:

    a. Armstrong World Industries Inc.
    b. Azrock Industries Inc.
    c. Johnsonite
    d. Kentile Floors Inc.
    e. Tarkett Inc.

D. Moldings and Edge Strips: Vinyl, manufactured by Johnsonite.

E. Sealer and Wax: Types recommended by floor material manufacturer.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that concrete floors are dry to maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, and dusting.

B. Fill minor low spots and other defects with subfloor filler.

C. Clean substrate.

D. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

3.2 INSTALLATION - SHEET AND TILE MATERIAL

A. Install in accordance with manufacturer's instructions.

B. Spread adhesive and set flooring in place. Press with heavy roller to attain full adhesion.

C. Install tile flooring with joints and seams parallel to building lines, with grain running in one direction. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install sheet flooring with seams parallel to width of room. Provide minimum of 1/3 full roll width. Double cut sheet and continuously seal with heat weld and butt joints hairline.

E. Scribe flooring to produce tight joints at items that penetrate flooring.

F. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated secure resilient strips by adhesive.

3.3 INSTALLATION - BASE MATERIAL

A. Adhere base tight to wall and floor surfaces.

B. Fit joints tightly and make vertical. Miter internal corners. At external corners, V cut back of base strip to 2/3 of its thickness and fold.

3.4 CLEANING

A. Remove excess adhesive from surfaces without damage.

B. Clean, seal, and wax surfaces in accordance with manufacturer's instructions.

…END OF SECTION

SECTION 09900

PAINTING

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Surface preparation and field application of paints and coatings.

1.3 SYSTEM DESCRIPTION

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.4 SUBMITTALS

A. Product Data: Provide data on all finishing products.

B. Samples: Submit coating samples for selection, illustrating range of colors and textures available for each surface finishing product scheduled.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

1.6 EXTRA MATERIALS

A. Provide minimum of two (2) gallons of each type and color of coating specified.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Products of one or more manufacturers are listed in Finish Schedules to establish appearance, performance and quality characteristics. Products of other manufacturers may be accepted subject to review by Architect.

1. ICI Paint Stores
2. Benjamin Moore and Co.
3. PPG Industries: Pittsburgh Paints
4. Pratt and Lambert

B. Coatings: Ready mixed except field catalyzed coatings of good flow and brushing properties, capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials required to achieve the finishes specified, as recommended by coating manufacturer..

2.2 FINISHES

A. Refer to schedule at end of section for surface finish schedule.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that substrate conditions are ready to receive Work.

B. Measure moisture content of porous surfaces using an electronic moisture meter. Do not apply finishes unless moisture content is less than 12 percent.

C. Correct minor defects and clean surfaces which affect work of this section.

D. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

E. Gypsum Board Surfaces: Fill minor defects with latex compounds. Spot prime defects after repair.

F. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

G. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove foreign matter. Remove oil and grease with a solution of tri-sodium phosphate, rinse well and allow to dry.

H. Uncoated Ferrous Surfaces: Remove scale by wire brushing, sandblasting, clean by washing with solvent. Apply treatment of phosphoric acid solution. Prime paint after repairs.

I. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust, hand or power tool clean, clean surfaces with solvent. Prime bare steel surfaces.

J. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

K. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

L. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied.

M. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied.

3.2 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Sand transparent finishes lightly between coats to achieve required finish.

C. Where clear finishes are required, tint fillers to match wood.

D. Back prime interior and exterior woodwork scheduled to receive paint finish with primer paint.

E. Back prime interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

F. Minimum Coating Thickness: As recommended by manufacturer.

G. Prime Coats: Prime material as recommended by manufacturer. Recoat primed surfaces as required to cover suction spots or unsealed areas.

H. Pigmented Surfaces: Completely cover to achieve an opaque, smooth surface of uniform finish, color and appearance. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other imperfections will not be accepted.

I. Transparent Finishes: Provide smooth surface of uniform luster, free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes or other imperfections.

3.3 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Division 15 and Division 16 sections for schedule of color coding, identification banding of equipment, ductwork, piping, and conduit.

B. Color code items in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

C. Paint shop primed equipment.

D. Remove unfinished louvers, grilles, covers, and access panels and paint separately. Paint dampers exposed behind louvers, grilles, convector and baseboard cabinets to match face panels.

E. Prime and paint insulated and exposed pipes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.

F. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line.

G. Paint exposed conduit and electrical equipment occurring in finished areas except prefinished surfaces.

H. Paint both sides and edges of plywood backboards.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. As work proceeds, promptly remove finishes where spilled, splashed, or spattered.

3.5 SCHEDULE - INTERIOR SURFACES

Surface	Finish	System	Product	Coats
Concrete	Sealer	Sealer	Glid Seal 19228	1
Drywall	Eggshell	Primer	ICI Ultra-Hide PVA Primer Sealer 1030-1200	1
		Finish	ICI Ultra-Hide Latex Eggshell Enamel 1412-XXXX	2
Drywall	Flat	Primer	ICI Ultra-Hide PVA Primer Sealer 1030-1200	1
		Finish	ICI Ultra-Hide Flat Enamel 1210-XXXX	1
Metal	Semigloss	Primer	ICI Devflex Acrylic Primer 4020-1000	1
		Finish	ICI Devflex Acrylic Semi-Gloss Enamel 4208-XXXX	2
Wood	Semigloss	Primer	ICI Ultra-Hide Acrylic Wood Primer 1020-1200	1
		Finish	ICI Ultra-Hide Latex Semi-Gloss Enamel 1416-XXXX	2
Wood	Clear	Primer	ICI Woodpride Urethane Satin 1908 reduced 25%	1
		Finish	ICI Woodpride Urethane Satin 1902	2

3.6 SCHEDULE - EXTERIOR SURFACES

Surface	Finish	System	Product	Coats
Metal	Gloss	Primer	ICI Devflex DTM Flat Primer 4020-1000	1
		Finish	ICI Devflex Acrylic Gloss Finish 4206-XXXX	2
Wood	Satin	Primer	ICI Ultra-Hide Durus Acrylic Latex Primer 2010-1200	1
		Finish	ICI Dulux Professional Finish 2402-XXXX	2

…END OF SECTION

Logan Place						
Portland Maine						
Notes:	1. Unless otherwise indicated, provide the same finishes for accessory spaces such as					
	closets as is specified for the adjoining room.					
	2. Provide for VCT floor tile patterns of (3) three colors in each room/space.					
Room Finish Schedule						
Room	**Floor**	**Base**	**Walls**	**Ceiling**	**Trim**	**Remarks**
UNITS TYPES						
Living Room/Bedroom	VCT	Vinyl Cove	Eggshell Paint	Eggshell or textured	Semi-Gloss Paint	
Kitchen	VCT	Vinyl Cove	Eggshell Paint	Eggshell or textured	Semi-Gloss Paint	
Closet/Lin.	VCT	Vinyl Cove	Eggshell Paint	Eggshell or textured	Semi-Gloss Paint	
Coat Closet	VCT	Vinyl Cove	Eggshell Paint	Eggshell or textured	Semi-Gloss Paint	
Bath	VCT	Vinyl Cove	Eggshell Paint	Eggshell or textured	Semi-Gloss Paint	
First Floor						
Front Vestibule (101)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Office (102)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
CHECK-IN (103)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Lobby (104)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Elevator (105)	-					
Closet (106)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Community Rm (107)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Kitchen (108)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #1 (109)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Laundry (110)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Toilet (112)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Meeting Room (113)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Mechanical Rm (114)	Conc. Sealer	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Jan/closet (116)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Office (117)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Office (118)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Rear Vestibule (119)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Electrical Room (120)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Elev Machine Rm (121)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Corridor (122)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Corridor (123)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #2 (130)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Second Floor						
Elevator Lobby (202)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Staff Office (203)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #1 (217)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #2 (218)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Corridor (216)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Third Floor						
Office (301)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Resource Library (302)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #1 (316)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Stair #2 (317)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	
Corridor (303)	VCT	Vinyl Cove	Eggshell Paint	Flat Paint	Semi-Gloss Paint	

Part II
Division 10

Specialties

SECTION 10005

MISCELLANEOUS SPECIALTIES

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Automatic Range Top Fire Extinguishing System.

D. Postal specialties

E. Closet Shelving

1.3 SUBMITTALS

A. Product Data: Provide data on Product, and accessories.

B. Operating and Maintenance Instructions: Include relevant instructions. Include maintenance information.

1.4 QUALITY ASSURANCE

A. Fire Extinguishers: Conform to NFPA 10.

B. Postal Specialties: Comply with USPS requirements.

2 PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Manufacturers:

1. Allenco.
2. Amerex.
3. Ansul Fire Protection
4. Bobrick Washroom Equipment.
5. JL Industries.
6. Larsen's Manufacturing Co.
7. Potter-Roemer/Div. Smith Industries Inc.

8. Walter Kidde/Div. Kidde Inc.

B. Multi-Purpose Dry Chemical Type: Enameled steel tank, with pressure gage, 2A:10BC rating..

C. Cabinets: Semi-recessed type, steel cabinet, full glass door with baked enamel finish.

D. Brackets: Manufacturer's standard surface mounted bracket for extinguishers not indicated to have a cabinet.

2.2 AUTOMATIC RANGE TOP FIRE EXTINGUISHING SYSTEM

A. Manufacturers:

1. SmartX Inc. (http://www.smartx.net, Tel: 905-894-2499)

B. Dry Chemical Type: Acu-Lite

C. Model: SmartX System COMPLETE AX-300 or approved equal.

D. Electric Shut Off Module: Provide plug-in shut off module to disconnect electrical connection to range in the event of fire detection. Coordinate with electrical contractor.

E. Installation: Install as directed in kitchen range hood.

F. Brackets: Manufacturer's standard surface mounted bracket for extinguishers not indicated to have a cabinet.

G. Provide system that meets the following specification:

1.0 SCOPE

1.1 Scope: This specification covers the requirement for an automatic stove-top fire extinguishing device which is capable of detecting, suppressing and preventing reignition of kitchen stove-top fires, while terminating the basic heat source and sounding an alarm.

2.0 DESCRIPTION: The stove-top automatic fire extinguishing device (referred to as the "system") described herein provides the capability of detecting, extinguishing and suppressing the reignition of a cooking fire on a stove-top while performing the ancillary function of terminating the basic heat source (electric or gas) and sounding an audible alarm. The system shall be UL listed and provide documentation that it complies with the USAF protocol 90 second response test. The system shall be designed to operate in the automatic mode.

The system shall consist of the following major components:

ITEM NAME	REQUIREMENTS
Detection Unit	2.2
Extinguishing Unit	2.4
Ancillary Function Mode	2.6

Associated Plumbing 2.7

The system shall be capable to being recharged, reset and returned to service after activation and clean up. This task of returning the system to service shall be accomplished by one (1) semi-skilled laborer in (1) hour or less. In some cases, the extinguishing unit may be considered disposable after activation.

2.1 Agent requirement: The agent shall be low PH type, (non-corrosive and non-toxic) having a PH of less than 12.5. If the agent has a PH in excess of 12.5 it must be so listed on the cylinder with instructions in conformance with the (EPA) Environmental Protection Agency hazardous materials sections. According to the EPA all materials having a PH in excess of 12.5 are hazardous materials.

2.2 Detection Unit: The detection unit shall be designed to activate the extinguishing unit on detection of a flame other than the normal stove-top gas flame or detection of a heat level above that is generated by normal cooking activities. The detector itself will normally be a thermal, or fusible link, glass bulb, or a precious metal sensor. However, other activation methods may be incorporated. If electronic detection is used it must be wired into a 110 volt power supply. Power must be transformed to low voltage and must have battery back up. Electronic detectors with batteries alone will not be allowed. Although the simplicity of the system is preferred by having (1) one detector, other methods will be allowed.

2.3 Mounting: The detection unit shall be mounted within the range hood. Mounting locations will be determined by the manufacturer. However, previous testing has shown that mounting the detection unit directly above and centered between the burners best allows the unit to meet the requirements of 2.2. This area above the stove in the hood is known as the OPTIMUM BTU TRANSFER ZONE.

2.4 Extinguishing Unit: The extinguishing unit shall be designed to evenly blanket the range top with an extinguishing agent to suppress the fire and prevent reignition with the heat source off. The unit shall consist of one or more agent containers and one or more nozzles with associated plumbing. The unit shall be designed for installation in the range hood area. A system with simple installation is desired, however, the complexity of the system shall not require more than one hour of installation time by one semi-skilled craftsman. Agent types and amounts will be determined by the manufacturer. Agents must satisfy the requirements of 2.1 and favorable consideration will be given to agent which can be effectively employed in smaller quantities and which do not lead to time consuming and tedious post-activation clean up.

2.5 Compatibility: The extinguishing unit and components hardware shall be compatible with the agent. The unit shall not generate flying debris and the nozzles shall be such that they provide uniform agent dispersal without imparting a velocity to the agent which causes it to splatter the burning oil and extend the fire beyond the cooking range surface.

2.6 Ancillary Function Module: This module shall be designed to provide: (a) a gas/electric shut-off to the range surface (b) an audible alarm (c) plug-in parts for central station, automatic dialer, auxiliary alarms and strobe alarms. The purpose is to comply with the (ADA) American Disabilities Act (d) gas range shut-off must be accompanied by additional module to terminate the electric accessory items present on the back of the stove such as clock, timer, temperature, and 110 volt plug. The

module shall be self contained, providing all of these functions from a single location. It is preferred that all gas and electric shut-offs be mechanical in function requiring "0" zero electric energy. Other shut-offs will be considered providing they do not hum or buzz and are simultaneous with disposing the fire extinguishing agent. Shut-offs that take more than (1) one second to shut down will not be considered simultaneous. The system shall cause interruption of the fuel or electric supply to the range, with or without normal electric power. When an electric operated valve is used, the configuration shall be such that the gas supply will not be interrupted in the event of a brown-out or power failure. Power for electric and gas valves shall be taken from the closest power source. Gas valves that are powered by batteries alone will not be allowed.

2.7 Associated plumbing: All plumbing and valves used to connect the system shall be compatible with the agent and shall be of sufficient size and type so as to not restrict the flow of the agent or cause an excessive pressure drop through the system. If a pressure gas/electric valve is used there must be a filter between the agent container and the operating valve so as to not contaminate the shut-off valve. Additionally, all plumbing and valves (except the system pressure relief valve, if provided) shall have a minimum safe working pressure corresponding to the pressure vessel containing the agent.

2.8 Electrical requirements: The system shall be capable of operating at variable power and cycle settings re: 120 volts 15 amps, 240 volts 50 amps, 50 or 60 cycles.

2.9 Documentation: The system shall be supplied with an operation and maintenance procedures manual, which give clear and concise instructions to those personnel using the system on the proper installation, operation and maintenance of the system to satisfy its intended use. The manual shall include sufficient drawings to permit semi-skilled personnel to install the system and to perform all maintenance and repair.

3.0 System leakage: The system shall not leak agent.

3.1 Warranty: The manufacturer/supplier will provide a minimum 12 year warranty on the extinguishing agent and all system components. The system cylinder must be exempt from internal inspection at the end of 6 years of usage. If a UL listing can not be given to support compliance the system cylinder must be internally inspected in accordance to the covenants of NFPA chapter 10. The manufacturer/supplier who are not exempt can agree in separate letter form that they will provide the inspection service and certification every 6 years at no cost to the Government.

3.2 Fire replacement of cylinder and fuse link: When a system is actuated during a fire there should be no replacement parts necessary for 12 years, providing the MFH officer or the Fire Chief submit a written report indicating the circumstances of the fire stating who, what, when, where and why within 30 days of the incident to the manufacturer/supplier. The manufacturer/supplier will agree to have a surplus of extra agent, cylinder and fusible links, in the amount of 4% more than the total amount of the contract. The extra surplus will be on hand at base supply for use as replacement to draw against at no charge to the Government. When 12 reports are received and 12 used cylinders and fusible links are received by the manufacturer/supplier, they will replace them within 30 days at no cost to the Government FOB place of manufacturer.

2.3 POSTAL SPECIALITES

A. Manufacturers:

1. American Device Mfg. Co.
2. Auth-Florence Manufacturing Co.
3. Bommer Industries Inc.
4. Cutler Manufacturing Corp.

B. Mailboxes: Horizontal style, front loading, key locking, for exterior application, in configuration indicated.

1. Quantity: 32 compartments plus letter drop and 2 parcel boxes.
2. Finish: satin anodized aluminum.

2.4 CLOSET SHELVING

A. Manufacturers

1. Clairson International/ClosetMaid
2. Schulte Corp.

B. Shelving: Steel wire shelving with manufacturer's standard PVC or epoxy coating and standard installation hardware.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that surfaces and internal wall blocking are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.2 INSTALLATION - FIRE EXTINGUISHERS

A. Install extinguishers in accordance with manufacturer's instructions.

B. Mount units to conform to ADA requirements, with top less than 48" above floor.

C. Install units level and plumb in wall openings.

3.3 INSTALLATION – POSTAL SPECIALTIES

A. Install postal specialties in accordance with USPS requirements and manufacturer's instructions.

B. Install units level and plumb in wall openings.

3.4 INSTALLATION – CLOSET SHELVING

A. Install shelving in accordance with manufacturer's instructions.

B. Install units level and plumb.

…END OF SECTION

SECTION 10425

SIGNS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following types of signs:

1. Interior panel signs.

2. Handicapped parking signs.

B. Related Sections: The following sections contain requirements that relate to this section:

C. Division 1 Section "Temporary Facilities" for temporary project identification signs.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

C. Samples: Provide samples of each sign component for initial selection of color, pattern, graphic content and surface texture as required and for verification of compliance with requirements indicated.

D. Schedule: Provide schedule of interior signage for coordination with Owner.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

2 PART 2 PRODUCTS

2.1 MATERIALS:

A. Acrylic: 1/8" thick sheet acrylic for interior engraved panel signs, in colors indicated or, if not indicated, as selected by Architect from the manufacturer's standards.

B. Aluminum: 0.080" mill finish aluminum sheet, for exterior signs.

C. Cast Aluminum: AA535 alloy aluminum.

D. Reflective sheet: 3M Scotchlite reflective sheeting for exterior panel sign backgrounds.

2.2 PANEL SIGNS:

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

B. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

C. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to conform with the following requirements:

1. Edge Condition: Square cut.

2. Corner Condition: Rounded corners.

D. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices. Comply with requirements of ANSI A 117.1-1986, Uniform Federal Accessibility Standard and Americans with Disabilities Act.

E. Tactile Signs: Machine-engrave background of letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, raised to uniform thickness.

1. Engrave the copy to produce a minimum character projection of 1/32" and a minimum stroke width of 1/4".

2. Form tactile letters in Helvetica style with upper case letters 1” in height.

3. Form accompanying Grade II Braille, raised 1/32".

F. Handicapped Parking Sign: Provide 12x18" standard reflective aluminum handicapped parking sign displaying the International Symbol of Accessibility as indicated.

2.3 FINISHES:

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches as selected by the Architect from the manufacturer's standards.

3 PART 3 EXECUTION

3.1 INSTALLATION:

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions. Comply with installation requirements of ANSI A 117.1-1986, Uniform Federal Accessibility Standard and Americans with Disabilities Act.

B. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

C. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape, of thickness recommended by sign manufacturer for installation intended, to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

2. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.

3. Mount signs @ 60” above floor on latch side of door.

D. Pole Mounted Panel Signs: Attach panel signs to heavy duty galvanized hat shaped channels. Mount signs @ 72” above grade. Paint poles in colors as directed.

E. Cast Letters: Projected spacer mounting. Mount in locations indicated.

3.2 CLEANING AND PROTECTION:

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

B. Restore sign surfaces that have been damaged prior to Substantial Completion. Replace damaged signs that cannot be repaired to satisfaction of Owner.

3.3 SIGN SCHEDULE:

A. Exterior Signs:

1. Handicapped Parking Signs: Provide one pole mounted sign at each designated handicapped parking space.

B. Interior Signs: Provide wall mounted tactile signs at the following locations:

1. Room Identification: Provide individual room identification signs at each interior door, with room name as indicated on schedules.: Coordinate verbiage with Owner.

C. Cast Letters: Provide letters as indicated on exterior walls.

…END OF SECTION

SECTION 10800

TOILET AND BATH ACCESSORIES

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Toilet and bath, shower, washroom accessories.

B. Grab bars.

1.3 SYSTEM DESCRIPTION

A. Conform to applicable code for installing work in conformance with ANSI A117.1 and ADA.

1.4 SUBMITTALS

A. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

B. Supply 2 keys for each accessory to Owner. Key all accessories alike.

2 PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers: Products of one or more manufacturers are listed in Schedules to establish quality, appearance and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.

1. American Specialties Inc.
2. Basco.
3. Bobrick Washroom Equipment Inc.
4. Bradley Corp.
5. Franklin Brass.
6. NuTone.
7. McKinney/Parker Products Co.
8. Miami-Carey.

B. Sheet Steel: ASTM A366.

C. Stainless Steel Sheet: ASTM A167 Type 304.

D. Tubing: ASTM A269 stainless steel.

E. Fasteners, Screws, and Bolts: Hot dip galvanized steel, tamper-proof.

2.2 FABRICATION

A. Form surfaces flat without distortion. Weld and grind joints smooth.

B. Shop assemble components and package with anchors and fittings.

C. Back paint components to prevent electrolysis.

D. Provide steel anchor plates, adapters, and anchor components for installation.

E. Hot dip galvanize exposed and painted ferrous metal and fastening devices.

2.3 FINISHES

A. Anchors: Galvanize to 1.25 oz./sq yd.

B. Ferrous Metals - Shop Primed: Pretreat and clean, spray apply one coat primer and bake.

C. Enamel: Pretreat, one coat primer and two coats baked enamel.

D. Chrome/Nickel Plating: ASTM B456, Type SC 2 polished finish.

E. Stainless Steel: No. 4 satin luster finish.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify exact location of accessories for installation.

B. Deliver inserts and rough-in frames to site. Provide templates and rough-in measurements as required.

3.2 INSTALLATION

A. Install fixtures, accessories and items in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

Continued next page…

3.3 SCHEDULE

ITEM (1)	QTY per Public Toilet Rm.	QTY per Unit (2)	MANUFACTURER	MODEL NO.
Grab Bars	36"+42"	36"+42" (H.C. only)	Bobrick	B-6206.99 series
Medicine Cabinet		1	NuTone	468MOD
Robe Hook	1	1	Bobrick	B6707
Shower Curtain Rod		1	Bobrick	B6107
Stainless Steel Mirror	1		Bobrick	B-165 1836
Toilet Tissue Dispenser	1	1	Bobrick	B-6857
Towel Bar	1	2	Bobrick	B530
Tumbler/Brush Holder		1	Bobrick	B6797

1. G.C. to provide solid wood blocking in wall for all scheduled toilet accessories.
2. Provide solid wood blocking at all locations of future grab bars (by owner) in all remaining handicapped adaptable units.

…END OF SECTION

Part II
Division 11

Equipment

Part II
Division 12

Furnishings

SECTION 12370

RESIDENTIAL CASEWORK

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Shop fabricated cabinet units and counter tops.

1.3 SUBMITTALS

A. Shop Drawings: Indicate casework locations, scale plans, elevations, clearances required.

B. Product Data: Provide data on component profiles, sizes, assembly methods, and schedule of finishes.

C. Samples: Submit samples of plastic laminate for selection of color and finish.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with KCMA (Kitchen Cabinet Manufacturers Association) - Certification Program.

2 PART 2 PRODUCTS

2.1 CASEWORK

A. Manufacturers: Products of one or more manufacturers are listed to establish quality, appearance and performance characteristics. Products of other manufacturers may be accepted subject to review by Architect.

B. Manufacturers of Cabinets:

1. Armstrong Cabinets
2. Kemper.
3. Kitchen Kompact Inc.
4. Merrilat Industries Inc.
5. UltraCraft.

C. Manufacturers of Plastic Laminate:

1. Formica Corp.
2. Nevamar.

3. Pioneer Plastics.
4. WilsonArt.

D. Cabinet Style: Armstrong “Coronet” flat panel in frame design, Honey finish.

2.2 CONSTRUCTION

A. Face Frame: Solid hardwood.

B. End Panels: ½” particleboard with hardwood veneer on exposed faces.

C. Back Panels: 1/8” hardboard.

D. Doors: Solid plantation hardwood stiles, rails and panels.

E. Drawer Fronts: Solid plantation hardwood.

F. Drawers: Hardwood plywood box construction.

G. Shelves: ½” particleboard.

2.3 HARDWARE

A. Drawer and Door Pulls: Brushed aluminum wire handles on 4 inch centers.

B. Hinges: Concealed, self-closing.

C. Drawer Glides: Side mounted, self-closing, 75 lb. capacity.

2.4 FACTORY FINISHING

A. Exposed To View Surfaces Stain, seal and varnish.

B. Interior Surfaces: Woodgrain printed vinyl surfacing.

2.5 COUNTERTOPS

A. Surface: High pressure plastic laminate, grade PF42.

B. Configuration: 290 post-formed front edge, integral cove, 90 post-formed backsplash.

C. Substrate: Particleboard.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify adequacy of backing and location of mechanical and electrical outlets.

B. Provide supplementary support framing.

3.2 INSTALLATION

A. Set and secure casework in place rigid, plumb, and level.

B. Provide cutouts for plumbing fixtures, appliances, and other fixtures and fittings.

C. Use fixture attachments at concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.

E. Carefully scribe casework which is against other building materials, leaving gaps of 1/32 inch maximum. Use filler strips, not additional overlay trim for this purpose.

F. Secure cabinet and counter bases to floor using appropriate anchorage.

G. Adjust moving or operating parts to function smoothly and correctly.

…END OF SECTION

SECTION 12511

WINDOW TREATMENT

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 specification sections apply to Work of this section.

1.2 SECTION INCLUDES

A. Curtain rods.

B. Roll-up shades.

1.3 SUBMITTALS

A. Product Data: Provide data indicating physical and dimensional characteristics and operating features.

B. Samples: Submit samples for selection of color and finish of shades.

2 PART 2 PRODUCTS

2.1 CURTAIN RODS

A. Manufacturers:

1. Bali-Graber Contract.
2. Kirsch.

B. Curtain Rods: Steel C shaped track system with nylon carriers, ball bearing pulleys and polyester cord traverse operation.

C. Accessory Hardware: Type recommended by manufacturer.

2.2 ROLL-UP SHADES

A. Shades: Vertical roll-up fabric window blind, with manual control to raise or lower by cord attached to stiffened lower blind edge.

1. Fabric Sheeting: Vinyl treated cloth or 4 ply room-darkening.
2. Pull Cord: Braided nylon.
3. Color: As selected

B. Roller: Wood or steel.

C. Roller Mechanism: Internally fitted with hardware for blind operation.

D. Attachment Hardware: Type recommended by blind manufacturer.

2.3 FABRICATION

A. Fabricate blinds to fit within openings with uniform edge clearance of 1/2 inch.

B. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch between assemblies, occurring at window mullion centers.

3 PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive the work.

3.2 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

C. Adjust blinds for smooth operation.

…END OF SECTION

Part II
Division 13

Special Construction

Part II
Division 14

Conveying Equipment

SECTION 14245

HYDRAULIC ELEVATORS

1 PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 sections, apply to work of this section.

1.2 SECTION INCLUDES

A. Passenger elevator systems.

B. Motor and pump, controllers, equipment and fitments.

1.3 SYSTEM DESCRIPTION

A. Hydraulic Elevator Systems: One unit; buried cylinder and casing, with motor and pump adjacent approximately 15 feet distant from the hoistway.

B. Characteristics of each elevator are as follows:

1. Rated Net Capacity: 2500 lbs.
2. Rated Speed: 150 ft/min.
3. Nominal Platform Size: 84x62 inches.
4. Clear Net Platform Size: 80x52 inches.
5. Cab Ceiling Height: 90 inches.
6. Hoistway and Cab Entrance Frame Opening Sizes: 42x84 inches.
7. Door Type: Single leaf.
8. Door Operation: Side opening.
9. Number of Stops: 3
10. Number of Openings: 3

C. Controls System: Conform to the following criteria:

1. Single Car Automatic Collective Operation elevator control system.

D. Special Operational Features:

1. Key operated Fire Department Service
2. Interconnect with building fire and smoke alarm system, with automatic recall to first floor.
3. Door Edge Protective Device: Infrared multi-beam door reversal device.
4. Emergency Telephone: Single push button operation with automatic dialer.
5. Seismic Design: In accordance with applicable BOCA code.

1.4 SUBMITTALS

A. Shop Drawings: Indicate the following minimum information on shop drawings:

1. Motor and hydraulic pump, valves, and other component locations.
2. Car, supporting beams, guide rails, and other components in hoistway.
3. Loads on hoisting beams.
4. Applicable seismic design data; certified by a Registered Professional Structural Engineer.
5. Elevator control functions and operational description.

B. Product Data: Provide data on the following items:

1. Signal and operating fixtures, operating panels, indicators.
2. Cab design, dimensions, layout, and components.
3. Cab and hoistway door and frame details.

C. Schematic: Provide legible schematic of hydraulic piping and electric wiring diagrams describing installed equipment. Provide one copy of master schematic, mounted in plastic glazed metal frame, mounted on machine room wall.

D. Samples: Submit two samples, illustrating cab floor material, cab interior finishes, cab and hoistway door and frame finishes.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the following:

1. ASME A17.1 - Safety Code for Elevators and Escalators.
2. UL 10B - Fire Tests of Door Assemblies.
3. Americans with Disabilities Act (ADA).

1.6 MAINTENANCE

A. Include description of elevator system's method of operation, control description, motor control system, cab and hoistway door operation, visual and audio signals, fire fighter's service, and specified non-standard features.

B. Include a parts catalog with complete list of equipment replacement parts.

C. Include legible schematic wiring diagrams of installed electrical equipment.

D. Provide one copy of master hydraulic and electrical schematic and one copy of lubrication chart, each framed with clear plastic glass; mount on machine room wall.

2 PART 2 PRODUCTS

2.1 ELEVATOR SYSTEM AND COMPONENTS

A. Manufacturers:

1. Canton Elevator
2. Dover Elevator
3. Otis Elevator

B. Structural Components, Cylinder and Casing: Required to construct elevator system and conform to code.

C. Casing Jacket: PVC.

D. Sheet Steel: ASTM A366/A366M Class 1 .

E. Stainless Steel: ASTM A167 Type 304 #4 finish.

F. Aluminum: ASTM B221 ASTM B221M, extruded.

G. Plastic Laminate: General Purpose type, fire retardant finish, matte surface finish, color/pattern as selected.

H. Motors, Pumps, Valves, Regulators, Fluid Tank, Hydraulic Fluid, Controller, Controls, Buttons, Wiring and Devices, Indicators: UL approved.

I. Spring Buffers, Attachment Brackets and Anchors: Purpose designed, sized according to code with safety factors.

J. Guides: T-shaped steel cab guide rails with 4” roller guides.

K. Pump Housing: Sheet steel, acoustically insulated, removable.

2.2 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:

1. 208 volts, three phase, 60 Hz.
2. Starter Characteristics: Reduced voltage.

B. Motor: NEMA MG1.

C. Disconnect Switch: Factory mount disconnect switch in control panel.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

2.3 CAB FABRICATION

A. Flooring: Carpet, of type specified in Section 09680

B. Walls: Plastic laminate on plywood

C. Front Return Panel: Stainless steel.

D. Base: Resilient vinyl cove , of type specified in Section 09650

E. Ceiling: Plastic eggcrate diffuser

F. Light Fixtures: Fluorescent,

G. Ventilation: Fan , grille above ceiling;

H. Control Panel and Face Plate: Stainless steel with illuminating call buttons.

I. Indicator Panel: above control panel with illuminating position indicators.

J. Hand Rail: Stainless steel flat bar stock, spaced from wall; placed at rear wall and side walls.

K. Pad Hooks: Stainless steel button type.

L. Protective Pads: One set sets, canvas cover, padded, brass grommets.

2.4 CAB ENTRANCES

A. Cab Doors: Painted steel of hollow panel construction, flush design, rolled profiles, rigid construction.

B. Cab Door Frames: Stainless steel, welded corner design with smooth invisible joints.

C. Thresholds: Extruded aluminum type.

2.5 HOISTWAY ENTRANCES

A. Hoistway Doors: Painted steel hollow sandwich panel construction, flush design, rolled profiles, rigid construction.

B. Hoistway Door Frames: Stainless steel of rolled profiles, knocked down design.

C. Door and Frame Construction: 1-1/2 hour fire rating.

D. Weatherstrip hoistway doors and frames to minimize audible noise.

E. Sills: Extruded aluminum . . .

F. Landing Buttons: Illuminating type, one for originating UP and one for originating DOWN calls, one button only at terminating landings; marked with arrows

G. Car Position Indicator: Illuminating, one per elevator per floor.

H. Car Direction Indicators: Illuminating, one per elevator per floor.

2.6 FINISHES

A. Baked Enamel on Steel: Clean and degrease metal surface; apply one coat of primer sprayed and baked; two coats of enamel sprayed and baked; color as selected.

B. Stainless Steel: #4 Satin Polished.

C. Aluminum: Clear anodized finish.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Verify that hoistway, pit and machine room are ready for work of this Section.

B. Verify shaft and openings are of correct size and within tolerances.

C. Verify that electrical power is available and of the correct characteristics.

3.2 EXCAVATION AND BACKFILLING FOR CASING

A. Excavation and Backfilling: Refer to Section 02200

B. Place plunger casing full depth of shaft. Align within 1/4 inch from plumb. Cut top of casing at hoistway pit slab elevation.

C. Backfill around plunger and hydraulic lines between plunger and remote machine room casing with structural type fill; placed in 24 inch lifts compacted to 95%

3.3 INSTALLATION

A. Install in accordance with ASME A17.1.

B. Install system components and connect to building utilities.

C. Accommodate equipment in space indicated.

D. Install elevator hydraulic equipment on vibration isolation pads.

E. Coordinate installation of hoistway wall construction.

F. Grout sills in place. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.

G. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.

H. Adjust automatic floor leveling feature at each floor to achieve 1/4 inch from flush.

3.4 TESTS BY REGULATORY AGENCIES

A. Obtain required permits to perform tests. Perform tests required by regulatory agencies.

B. Schedule tests with agencies and Architect/Engineer, Owner, and Contractor present.

…END OF SECTION

Part II
Division 15

Mechanical

SECTION 15000 - SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

The General Conditions, Supplemental General Conditions and Instructions to Bidders shall apply to this work. Read these to be familiar with conditions related to the installation of the work.

1.02 WORK SHOWN ON DRAWINGS

A. The drawings accompanying this specification, as a part thereof, are working drawings indicating the location and arrangement of the increments of the systems of this section of work. Material deviation from this arrangement, process or means of application, shall bear the Engineer's review stamp before the change is made on the job or materials are ordered. Changes made without such review shall be ordered removed and items installed as specified shall be provided at no additional expense to the Owner.

B. The drawings are not intended to show in minute detail minor items of installation or materials such as specific fittings or findings.

1.03 MATERIALS AND LABOR

A. Furnish materials and labor necessary to deliver to the Owner a complete and operable system installed in accordance with the contract documents.

B. Materials shall be of the best quality. Workmanship shall be of highest grade and construction shall be done according to best practices of the trade.

C. Provide, when required, labeled samples of material or equipment specified herein or proposed to be used in this work.

D. Where words "furnish", "provide", or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install", including materials complete with connections, supplemental devices, accessories and appurtenances, unless specifically otherwise noted. These words are likewise hereby interpreted as being prefixed to materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or scheduled information or in the technical sections of the specifications.

1.04 EQUIPMENT INSTALLATION IN HEATING SEASON

A. The system shall be installed such that the construction area will have sufficient heat to maintain temperature above 40^{o}F throughout the construction period.

1.05 COOPERATION BETWEEN TRADES

A. Provide information sufficiently in advance of this work, so that work by the other trades may be coordinated and installed without delays. Furnish and locate sleeves, supports, anchors and necessary access panels.

B. Where work is concealed, assure it does not project beyond finished lines of floors, ceilings, or walls.

C. Equipment or piping requiring access found to be located above sheetrock ceilings shall be brought immediately to the attention of the Architect for resolution.

1.06 ORDINANCES, AUTHORITIES, PERMITS, AND FEES

A. Obtain necessary permits and licenses, give notices and comply with laws, ordinances, rules, regulations or orders affecting the work, and pay fees and charges in connection therewith.

B. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

1.07 PROTECTION OF WORK AND MATERIALS

A. Protect and care for materials delivered and work performed until the completion of the work. Defective equipment or equipment damaged in the course of storage, installation or test shall be replaced or repaired to the satisfaction of the Engineer at no additional cost to the Owner.

1.08 INSURANCE

A. Purchase and maintain Public Liability and Property Insurance during the progress of the work and until completion and acceptance of the entire project by the Owner in the amounts as specified in the General Conditions.

1.09 APPLICABLE CODES

A. Work and materials shall conform to the latest rules and regulations listed below and these rules and regulations hereby are made part of this specification. They include, but are not necessarily limited to the following:

American Society for Testing and Materials (ASTM)
Underwriters' Laboratories, Inc. (UL)
Air Moving and Conditioning Assoc. (AMCA)
American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
National Electrical Manufacturers Association (NEMA)
Institute of Electrical and Electronics Engineers (IEEE)
American National Standards Institute (ANSI)

National Fire Protection Association (NFPA)
American Water Works Association (AWWA)
Local Fire Code
Local Plumbing Codes
American Welding Society

1.10 SHOP DRAWINGS

A. Submit shop drawings, manufacturers' data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, five (5) copies, to be submitted to the Architect. Shop drawings will be returned "No Exceptions Taken", "Make Corrections Noted", "Amend and Resubmit", "Submit Specified Item", or "Rejected" less two (2) copies. Work shall progress in accordance with "Reviewed" shop drawings (ONLY).

B. Groups of similar shop drawings shall be submitted as individual bound documents with covers and indexes. Typical similar items would be "Diffusers and Registers", "Valves and Controls". Rejection of individual items shall not be cause for rejection of the entire document.

C. Clearly indicate item(s) to be reviewed on each submission by highlighting or underlining intended item(s). Submissions not clearly marked shall be returned "Amend and Resubmit".

D. Shop drawings must bear the Engineer's review stamp. In the event that the Engineer returns shop drawings "Amend and Resubmit" or "Rejected", the shop drawing must be revised and resubmitted for review.

E. Furnishing of the specified item must still produce the results and performance, dependability and quality reasonably to be expected within the spirit of the specifications, drawings, and the standard of good mechanical performance normal to the trade.

1.11 SUBSTITUTIONS

A. Where the specifications allow the substitution of a product, still this product is subject to review by the Engineer in accordance with the paragraph entitled "Shop Drawings". Review of a substitute item is an indication only that the substitute item is compatible with the specified item as a claim of the manufacturer. Insure dimensional propriety, performance, and quality of the substitute item.

B. Reference in the specifications or on the drawings to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Engineer is first obtained. The (ONLY) notation in the specification is an exception to this and leaves no option.

C. For materials or equipment which are supplied with integral or factory applied finish, the colors will be considered in evaluating substitutions.

D. For the purpose of avoiding conflicts with other trades, contracts, and adjoining work where more than one (1) article, device, material, fixture, form or proprietary name, manufacturer, make or catalog number, the first named shall be used as the basis of design and details. The cost of any changes because of substituted item shall be borne by the Contractor requesting such change.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EQUIPMENT SUPPORTS

A. Furnish and install equipment supports for mechanical equipment as required. Supports shall be subject to review by the Engineer.

3.02 SLEEVES AND PREPARED OPENINGS

A. Coordinate cutting, patching and setting of sleeves, frames, framing and lintels for openings with other trades. Sleeves shall be furnished by the Contractor.

B. Failure to give timely notice of and to locate openings and furnish sleeves shall cause no additional expense to the Owner.

3.03 CONNECTION TO EQUIPMENT

A. Provide piping connections, supports, brackets, compensators or flexible connections to prevent application of excessive stresses to equipment.

B. Equipment shall be installed with flanges or unions in such a manner as to permit disconnecting for removal of tubes, coils, elements and other equipment for inspection, service and repairs.

3.04 ACCESS TO EQUIPMENT

A. The installation of work performed shall provide reasonable accessibility for operation, inspection, and maintenance of equipment and accessories. The Engineer shall determine the adequacy of such accessibility.

3.05 ACCESS PANELS

A. Access panels shall be provided where indicated on the drawings and as required for access to valves and other serviceable components.

B. Access panels installed in fire-rated assemblies shall have the same fire rating as the assembly.

3.06 PAINTING OF EQUIPMENT

A. Exposed ironwork, including steel supports and hangers in unfinished spaces, mechanical rooms, pits, and trenches shall be properly cleaned, prepared and painted with two (2) coats of black asphaltum varnish.

3.07 GUARDS

A. Exposed moving and rotating elements of mechanical equipment items shall be protected with suitable guards for personnel protection. Guards shall be of rigid construction, firmly positioned. Holes shall be provided in guards at shaft centers to facilitate tachometer readings.

3.08 LUBRICATION

A. Furnish and install grease fittings for points requiring lubrication. Furnish extension type fittings as required to provide easy access for maintenance lubrication.

B. Furnish initial charges of lubricants for equipment. Lubricants shall be in conformance with the manufacturer's requirements and recommendations.

3.09 ELECTRIC MOTORS AND MOTOR CONTROLS

A. Unless otherwise noted, motors, motor starters and other electrical accessories which are specified under Mechanical specifications shall be selected with characteristics as follows:

1/2 Horsepower and less - 120 volt, 1 phase, 60 Hz.
3/4 Horsepower and greater - 208 volt, 3 phase, 60 Hz.

B. Motors shall be built in accordance with the latest applicable NEMA, IEEE and ANSI Standards. Motors shall be of the latest type and quality specified under individual items of equipment.

C. Magnetic motor starters for mechanical items of equipment shall be furnished under Division 16 unless the starter is an integral part of a factory packaged item of equipment. Each starter furnished as an integral item of equipment shall be provided with overload heater elements. Starters shall have single phase protection or shall have relays installed to provide this feature. Starters shall be equipped with suitable step-down transformers to provide required control voltage.

D. Motors shall have a minimum continuous duty service factor of 1.15. Minimum motor efficiency shall be:

MOTOR HORSEPOWER	PERCENTAGE EFFICIENCY		
	(1200RPM)	(1800 RPM)	(3600 RPM)
1,1-1/2,2,3	----	78.0	76.0
5	87.4	87.4	86.3
7.5	89.4	89.8	87.7
10	89.7	90.3	89.0
15	90.5	91.4	89.3

3.10 CLEANING OF SYSTEMS

A. Piping systems shall be thoroughly cleaned and flushed prior to initial operation.

B. Thoroughly clean exposed portions of the mechanical installation, removing labels and foreign substance.

C. Furnish detergents, solvents, cleaning compounds, and tools required for cleaning operations.

D. Keep the premises free from accumulation of waste material or rubbish and at the completion of the work, remove from the job site tools, scaffolding, surplus materials, and rubbish, leaving the work areas "broom" clean.

3.11 STARTING OF EQUIPMENT

A. Testing or starting of equipment shall be done in collaboration with trades concerned to insure safe and proper operation of the equipment.

B. Prior to starting equipment, provide lubrication at required points. Before starting any electrical or electric motor driven equipment, a check must be made to insure that proper heater coils are installed in the starters and that the equipment is rotating in the proper direction.

3.12 OPERATIONAL TESTING

A. Operate systems until successful operation is demonstrated to the Engineer. This initial operation shall be in addition to the testing of the system and shall be done after the system is cleaned and finished.

3.13 RECORD DRAWINGS

A. During construction, keep an accurate record of deviations to the installation of the work as indicated on the drawings. Upon completion of the work, furnish a copy of this record to the Engineer. **Submit record drawings before requesting final payment**.

3.14 MANUFACTURER'S REPRESENTATIVE

A. As indicated in the Technical Sections of this specification or as directed by the Engineer, provide the services of a factory trained Engineer or Technician to inspect, adjust, and place in proper operating condition the equipment or item involved. No additional compensation will be allowed for such service.

3.15 MANUFACTURER'S INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

A. Provide for each item of equipment or apparatus furnished, a complete set of printed instructions obtained from the manufacturer covering proper operation, maintenance, lubrication, cleaning, servicing, adjustment, and safety instructions.

B. Manufacturer's data shall include performance data (curves are preferred where applicable) complete parts lists, recommended spare parts lists, piping, and wiring diagrams.

C. Arrange data in complete sets, properly indexed and marked.

D. Data shall include a complete set of shop drawings.

E. Material shall first be submitted in preliminary form for review by the Engineer. After review, submit two (2) copies in bound volumes to the Engineer for distribution.

3.16 GUARANTEES

A. An item becomes "defective" when it ceases to conform to the Contract Documents. Guarantees begin on the date of issuance of a certificate authorizing final payment or certificate of substantial completion with the Owner taking occupancy or beneficial use thereafter.

B. Upon completion of the work and before applying for final payment, furnish a written guarantee, stating that the work complies with the provisions of codes listed herein and the local enforcing authorities, and that it will be free from defects of material and workmanship for not less than one (1) year. Guarantee shall further state that the Contractor will, at his own expense, repair or replace any of his material and work which may become defective during the time of guarantee, together with other work damaged as a consequence of such defects.

C. Where special guarantees, covering installation, operation or performance of any systems, or equipment furnished under are indicated, the full responsibility for the fulfillment of such guarantees must be assumed by the Contractor who shall obtain written guarantees in triplicate, two (2) copies of which shall be filed with the Engineer before final acceptance.

D. Repeated malfunctioning or failure in service of any item or work of the system is sufficient cause for the Engineer to order the removal of the item, and its replacement with new item at the expense of the Contractor.

* END OF SECTION *

SECTION 15250 - INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and the specifications including Section 15000 “Supplemental General Mechanical Conditions” are hereby made a part of the work of this section.

1.02 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to insulate the heating, ventilating, air conditioning, and plumbing systems.

1.03 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 15000, Supplemental General Mechanical Requirements, apply are as follows:

1. Piping insulation.
2. Duct insulation.
3. Equipment insulation.
4. Insulation application schedule.

1.04 DEFINITIONS

A. Finished Spaces: Spaces other than furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels, unless specifically listed below as an unfinished space.

B. Unfinished Spaces: Mech/Elect Rooms and attic.

C. Unconditioned Spaces: Spaces exposed to near outside ambient temperatures - attic.

C. Outside: Areas beyond the exterior side of walls or above the roof, unexcavated spaces, and crawl spaces.

D. Concealed: Not visible in finished or unfinished spaces. For example, above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.

E. Exposed: Visible from a finished or unfinished space.

1.05 MANUFACTURER'S STAMP OR LABEL

A. Packages or standard containers of insulation, jackets, cements, adhesives, and coatings delivered to the project site for use must have the manufacturer's stamp or label attached giving name of manufacturer, brand, and description of material. Insulation shall be asbestos-free.

1.06 FLAME SPREAD AND SMOKE DEVELOPED RATINGS

A. Materials shall have a flame-spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with NFPA 255, ASTM E84, or UL 723.

B. Provide materials with flame resistant treatments not subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, or heat.

C. Materials Exempt From Fire-Resistant Rating: Nylon anchors for securing insulation to ducts or equipment.

PART 2 PRODUCTS

2.01 PIPING INSULATION

A. Fiberglass: Heavy density preformed fiberglass with thermal conductivity of 0.29 Btu-in/hr-ft^2-^{o}F at 150^{o}F mean temperature. Insulation shall conform to ASTM C547 Class I and shall be suitable for 450^{o}F service. Fitting insulation shall be of same material used for pipe.

1. Insulation Jacket: All service (ASJ) type conforming to Fed. Spec. HH-B-100B Type I. Jacket permeability shall not exceed 0.02 perms (ASTM E96). Pipe fitting jacket shall be factory premolded, one-piece, PVC covers with pressure sensitive taped joints. Jackets in exposed locations shall have a white surface suitable for field painting. Provide vapor barrier as required by service.

B. Flexible Unicellular: Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft^2-^{o}F at 75^{o}F mean temperature. Insulation shall conform to ASTM C534, Type I, Tubular and shall be suitable for 200^{o}F service. Fitting insulation shall be of same material used for pipe. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

C. Fittings, Flanges, and Valves: Provide insulation for fittings, flanges, and valves premolded, precut, or job fabricated of the same thickness and conductivity as used on adjacent piping.

D. Insulation Kit: Insulate exposed supply and waste piping at handicapped accessible sinks with fully molded insulation kit. McGuire Products ProWrap, 3/16" thick closed vinyl with anti-microbial additive, 1.02 Btu-in/hr-F^2-^{o}F thermal conductivity, white color.

2.02 EQUIPMENT INSULATION

A. Fiberglass (Hot Equipment): Semi-rigid fiberglass board conforming to Fed. Spec. HH-I-558B, Form B, Type I. Thermal conductivity shall be 0.32 Btu-in/hr-ft^2-^{o}F at 150^{o}F mean temperature

(ASTM C177), insulation shall be suitable for 650°F service. Insulation jacket shall be "all service" type conforming to Fed. Spec. HH-I-100B Type I or II. Jacket permeability shall not exceed 0.02 perms (ASTM E96).

B. Flexible Unicellular (Cold Equipment): Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft^2-°F at 75°F mean temperature. Insulation shall conform to ASTM C534, Type II, sheet and shall be suitable for 200°F service. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

2.03 DUCT INSULATION

A. Fiberglass (Ductwrap): Fiberglass duct wrap with foil-scrim-kraft facing/vapor barrier, 1.0 lb/cu.ft. density (0.75 lb/cu.ft. for 3" thickness only), 0.29 Btu-in/hr-ft2-oF conductivity at 75oF mean temperature, 0.05 permeance rating. Insulation shall meet the requirements of NFPA 90A & B and shall be UL rated. Provide foil-scrim-kraft (FSK) tape.

2.04 BREECHING

A. Mineral Fiber: Mineral fiber blanket conforming to Fed. Spec. HH-I-558B Form C with thermal conductivity of 0.36 Btu-in/hr-ft^2-°F at 300°F mean temperature. Insulation shall be suitable for continuous 1200°F service temperature and shall be 6.0 lbs/cu.ft. density. Jacketing shall be 14 oz. rewettable fiberglass glass cloth conforming to MIL-C-20079 Type I Class 4 covered with vinyl-acrylic mastic applied in two coats to a minimum dry film thickness of 1/16 inch.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the insulation systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.02 GENERAL

A. Insulate after system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and are dry.

B. Install insulation with jackets drawn tight and cement down longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems and pipe penetrations through fire rated assemblies. Extend surface finishes to protect ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Keep insulation dry during the application of the finish. Bevel and seal the edges of exposed insulation.

C. Unless otherwise indicated, do not insulate the following:

1. Factory pre-insulated flexible ductwork.
2. Factory pre-insulated ductwork, plenums, casings, mixing boxes, and filter boxes.
3. Chrome plated pipes and fire protection pipes.
4. Vibration isolating connections
5. Adjacent insulation
6. ASME stamps, nameplates, access plates
7. Ductwork exposed to view in a normally occupied space.
8. Hydronic specialties: Low water cutoff, relief valves, relief valve discharge piping, pressure reducing valves, and expansion tanks.
9. Unions and flanges at equipment required for frequent service.

3.03 PIPING INSULATION

A. Pipe Insulation (Fiberglass): Place sections of insulation around the pipe and joints, tightly butt into place. Draw jacket laps tight and smooth. Secure jacket with fire resistant adhesive, or factory applied self sealing lap. Cover circumferential joints with butt strips, not less than 3-inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps.

B. Flanges, Unions, Valves and Fittings Insulation (Fiberglass): Factory fabricated removable and reusable insulation covers. Place factory pre-molded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling or with metal or plastic tacks made for securing PVC fitting covers and secure with PVC vapor barrier tape.

C. Pipe Insulation (Flexible Unicellular): Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Insulate flanges, unions, valves, and fittings.

D. Where penetrating roofs and exterior walls, insulate piping to a point flush with the underside of the deck or wall and seal with a vapor barrier coating.

E. Hangers and Anchors: Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide MSS SP-58, Type 40 galvanized steel shields (16 gage maximum). For fiberglass insulation systems on pipe sizes 2 inches through 3", provide insulation inserts at points of hangers and supports. Insulation inserts shall be of molded glass fiber (minimum 12 pcf). Insulation inserts shall cover the bottom half of the pipe circumference, 180 degrees, and be not less than 4" long. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation. Insulation inserts for pipe sizes 4" and larger shall be welded pipe saddles. Install insulation in void area of saddle of same material used on adjacent insulation. For pipe sizes 2" and smaller, insulation inserts for flexible unicellular insulation systems shall be wooden doweling set on end of length equal to insulation thickness. Seal dowel to insulation with adhesive.

F. PVC or Metal Jackets: Provide over insulation. Machine cut jacket to smooth edge of circumferential joints. Overlap metal jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9 inch centers. Overlap

longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by insulation manufacturer for weatherproofing. Solvent weld PVC jacket system to provide continuous watertight seal.

3.04 DUCT INSULATION

A. Rigid Insulation: Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from joint edges of boards, spaced not more than 12 inches on centers and secure with washers and clips. Spot weld anchor pins or attach with a waterproof adhesive especially designed for use on metal surfaces. Each pin or anchor shall be capable of supporting a 20-pound load. Cut off protruding ends of pins. After installing washers, provide foil-scrim-kraft (FSK) tape to seal break in vapor barrier, tape shall extend 1" minimum around pin. Apply insulation with joints tightly butted. Bevel insulation around name plates and access plates and doors. Seal joints with FSK tape. Provide additional adhesive or staples to assist tape adhesion in difficult applications.

B. Flexible Blanket Insulation: Apply insulation with joints tightly butted. Staple laps of jacket with outward clinching staples and seal with foil scrim kraft (FSK) tape. Sagging of flexible duct insulation shall not be permitted. For ductwork over 24-inches wide on horizontal duct runs, provide pins, washers and clips. Install speed washers with pins and pin trimmed to washer. Cut off protruding ends of pins after clips are secured. Seal with FSK tape, extend tape 1" minimum around pin. Use pins on sides of vertical ductwork being insulated. Space pins and clips on 18 inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers.

3.05 EQUIPMENT INSULATION

A. General Procedures: Apply equipment insulation suitable for temperature and service to fit as closely as possible to equipment. Join sections of insulation with adhesive. Bevel insulation around name plates, ASME Stamp, and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Provide vapor barrier seal at joints and seams for "cold" equipment.

B. Heating Equipment: Provide semi-rigid mineral fiber board insulation. Seal longitudinal and lateral seams with FSK tape. Bond cuts, ends, and mitered sections with adhesive. Provide a vinyl-acrylic mastic coating on exposed fiberglass ends.

C. Cold Equipment: Provide flexible unicellular sheet insulation, bond cuts, butt joints, longitudinal joints and ends with vapor barrier adhesive. Vapor seal exposed edges to equipment.

3.06 BREECHING INSULATION

A. Provide mineral fiber blanket insulation. Miter and cope to fit breeching. Insulate the smoke hood at the boiler outlet as an integral part of the breeching. Apply rewettable fiberglass cloth, draw tight and smooth, overlap seams a minimum of 3 inches. Provide vinyl-acrylic mastic finish in two coats for a minimum dry film thickness of 1/16".

3.07 INSULATION APPLICATION SCHEDULE

SERVICE	THICKNESS	MATERIAL/JACKET
PIPING:		
Domestic Cold Water Piping		
1" and smaller	1/2"	Fiberglass w/ASJ or Flexible Unice
1-1/4" and larger	1"	Fiberglass w/ASJ or Flexible Unice
Domestic Hot Water Piping and Domestic Hot Water Recirculation Piping 2" and smaller	1"	Fiberglass w/ASJ or Flexible Unice
Domestic Water Branch Piping Less than 10 ft in Stud Walls	1/2"	Fiberglass w/ASJ or Flexible Unice
Water and Drain Piping Under Handicap Accessible Fixtures		Insulation Kit
Hot Water Heating Supply and Return Piping	1-1/2"	Fiberglass w/ASJ
Hot Water Heating Supply and Return Branch Piping Less than 10 ft in Stud Walls	1"	Fiberglass w/ASJ
Refrigerant Suction and Liquid Piping (outside)	½"	Flexible Unicellular w/vapor barrie and PVC jacket
Refrigerant Suction and Liquid Piping (inside)	½"	Flexible Unicellular
Condensate Drain Piping	½"	Flexible Unicellular
DUCTWORK:		
Combustion Air Ductwork	3"	Ductwrap, FSK
Exhaust Ductwork	1-1/2"	Ductwrap, FSK
Laundry Make-Up Duct/ Mechanical Room Vent Duct	3"	Ductwrap, FSK
Outside Air Ductwork from the Louver to the Air Handling Unit	3"	Ductboard, FSK

SERVICE	THICKNESS	MATERIAL/JACKET
DUCTWORK:		
Supply and Return/Exhaust Ductwork in the Attic	3"	Ductboard, FSK
EQUIPMENT:		
Water Meter	1/2"	Flexible Unicellular
Backflow Preventer	1/2"	Flexible Unicellular
Heating System Air Separators	1-1/2"	Fiberglass, ASJ
Air Separators, Flexible Connectors, Valves	1/2"	Flexible Unicellular
Boiler Breeching	2"	Mineral Fiber, Glass Cloth and Mastic

3.08 FIELD INSPECTION

A. Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

* END OF SECTION *

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and the specifications including Section 15000 “Supplemental General Mechanical Conditions” are hereby made a part of the work of this section.

1.02 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections, and incidentals and the performing of operations required to provide a complete and functional plumbing system.

B. Work shall be in accordance with the current edition of the BOCA International Plumbing Code and applicable local ordinances.

1.03 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 15000, Supplemental General Mechanical Requirements, apply are as follows:

1. Piping materials.
2. Valves.
3. Pipe hangers.
4. Fixtures and trim.
5. Miscellaneous equipment.
6. Water heating equipment.
7. Piping, valves and equipment identification.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Soil and Waste (Sanitary) and Vent Piping: Cast iron with push-on joints below grade. Cast iron "no Hub" above grade. Sanitary piping below grade and vent piping above grade may be PVC at contractor's option, cast iron (ONLY) thru roof. PVC shall not be installed in plenum rated spaces.

B. Domestic Water Piping (Above Grade): Type L hard copper tubing and cast bronze or wrought copper solder fittings.

C. Exposed Water and Waste Piping at Fixtures: I.P.S. copper with cast brass fittings chrome plated finish, with deep one piece escutcheon plates at traverse points.

D. Solder: Lead-free (ONLY), Englehard Silvabrite 100, 440°F melting point, ASTM B32.

E. Underground Cold Water Piping (Building Entrance): ASTM D2737 black polyethylene tubing, 200 psi rated with brass or bronze adapters complete with stainless steel clamps.

2.02 GAS PIPING SYSTEM

A. Gas Piping: Schedule 40 carbon steel pipe conforming to ASTM 120 or A53, with threaded joints and malleable iron fittings (Above grade).

B. Ball Valves for Gas Service: Copper alloy with chromium plated floating ball per Federal Specification WW-V-35B, Type II, Class 3. Blowout-proof stem, reinforced teflon seats, threaded ends, quarter turn on-off, 600 WOG rating, 250 psi rating for natural gas, UL-listed as an natural gas shutoff valve, Apollo Model 80-100 series.

2.03 VALVES

A. Ball Valves: Copper alloy with stationary seat ring and chromium plated or stainless steel floating ball per Federal Specification WW-V-35B. Blowout proof stem, reinforced PTFE seal. Sizes 2" and larger shall have threaded ends. Provide lever handle with stem extension as required to allow operation without interfering with pipe insulation.

B. Check Valves: Horizontal Swing, MSS SP-80, Type 3, Class 125.

C. Drain Valves: Provide ball valves with 3/4" hose connection and brass cap.

D. Fixture Service Stop Valves: Angle Wheel Handle Stop, ASME A112.18M.

1. Each plumbing fixture shall have individual stop valves in the hot and cold supplies.

2. Service stop valves exposed in finished areas shall be chrome-plated brass; in non-finished areas, ball valves shall be used in lieu of chromed supplies.

E. Temperature and Pressure Relief Valves: Bronze body, tested under ANSI Z21.22, AGA and ASME rated, 125 psig/210°F relief settings.

F. Balancing Valves: Taco Circuit Setter.

1. Bronze or brass body and internals, teflon seats, memory stop, 175 psi working pressure, 250°F working temperature. Balancing devices shall have provisions for connecting a portable differential pressure gauge. Each balancing device shall be sized to provide a differential pressure reading between 2 and 5 feet with the valve full open at design flow rates.

2. Install per manufacturer's recommendations for adjacent length of straight pipe.

3. Submittals shall indicate gpm, size, wide open differential pressure meter reading, and actual water pressure drop.

G. Pressure Reducing Valves: Watts Regulator series U5LP bronze body, bronze internals, 200 psi working pressure, 200°F maximum temperature, adjustable pressure range 10-25 psig. Provide with inlet strainer (screen).

2.04 PIPE HANGERS

A. Adjustable Swivel Hangers:

1. Pipe sizes 2" and less: Carpenter and Paterson Fig. 800, oversize for insulated piping systems.

2. Pipe sizes larger than 2": Carpenter and Paterson Fig. 100, oversize for insulated piping systems.

B. Riser Clamp: Carpenter and Paterson Fig. 126 CT copper plated for copper piping, Fig. 126 for iron and PVC piping.

C. Insulation Shields: 18 ga. galvanized steel, 180° wrap, Carpenter and Paterson Fig. 265P, Type H.

D. All piping 20' upstream and downstream of pumps shall also have Mason Industries PC30N precompressed double deflection spring isolators installed.

2.05 FIXTURES AND TRIM

A. (P-1) Water Closet: Floor-mounted, flush-valve type, American Standard Madera EL 1.6, elongated bowl, white vitreous china, low consumption (1.6 gpf), shall flush with 25 psi water pressure at valve.

1. Flush Valve: Sloan Royal #111.

2. Seat: Church Model 380TC, commercial weight solid plastic, closed front with cover, self sustaining check hinge, for elongated bowl, white cover.

B. (P-1A) ADA Water Closet: Floor-mounted, flush-valve type, American Standard Madera 17 EL 1.6/FV, elongated bowl, white vitreous china, low consumption (1.6 gpf), shall flush with 25 psi water pressure at valve.

1. Flush Valve: Sloan Royal #111.

2. Seat: Church Model 380TC, commercial weight solid plastic, closed front with cover, self sustaining check hinge, for elongated bowl, white cover. Water closet in "Toilet 112" shall have an open front seat without a cover.

3. Total installed height of front edge of seat shall be 17" to 19" above finished floor. Final installation shall meet ADA guidelines and ANSI A117.1.

C. (P-2) Lavatory, Countertop: New England Marble and Granite "Camden", 27" wide x 22" deep with backsplash. Matte finish, color by Architect.

1. Faucet: Symmons Symmetrix Model S-20-2 single handle, 0.5 GPM aerator, polished chrome finish, ceramic control cartridge.

2. Drain: Pop-up drain assembly with bright metal finish.

3. Trap: Chrome-plated, cast copper alloy, 1-1/4" P-trap with cleanout plug. Adjustable with connected elbow and nipple to wall.

D. (P-2A) ADA Lavatory, Countertop: New England Marble and Granite "Camden", 27" wide x 22" deep with backsplash. Matte finish, color by Architect.

1. Faucet: Symmons Symmetrix Model S-20-2 single handle, 0.5 GPM flow aerator, polished chrome finish, ceramic control cartridge.

2. Drain: Pop-up drain assembly with bright metal finish.

3. Trap: Chrome-plated, cast copper alloy, 1-1/4" P-trap with cleanout plug. Adjustable with connected elbow and nipple to wall.

4. Lavatory shall be installed at 34" above finished floor (See Architectural drawings). Final installation of lavatory and accessories shall meet ADA guidelines and ANSI A117.1. Insulate traps and supplies with Truebro Lavguard.

E. (P-3) Kitchen Sink, Single Bowl: Elkay "Dayton" D11721, or Just, stainless steel, 17"x21.25" overall size, 14"x15.75"x6.5" deep bowl, 3 faucet holes on 4" centers, fully sound deadened.

1. Faucet: Chicago Model 2301-8, single handle, 2.0 gpm aerator, 10" spout, polished chrome finish, ceramic control cartridge.

2. Strainer: Dayton Model D-1125 with removable basket and neoprene stopper.

F. (P-4) ADA Kitchen Sink, Single Bowl: Elkay "Dayton" GE-12521, or Just, stainless steel, 25"x21.25" overall size, 21"x15.75"x5.375" deep bowl, 4 faucet holes on 4" centers, fully sound deadened. Drain shall be located in upper left or right corner of bowl as indicated.

1. Faucet: Chicago Model 2301-8, single handle, 2.0 gpm aerator, 10" spout, polished chrome finish, ceramic control cartridge, hose and spray.

2. Strainer: Dayton Model D-1125 with removable basket and neoprene stopper.

3. Sink installation shall be in compliance with the ADA guidelines.

4. Exposed traps and supplies with Truebro Lavguard.

G. (P-5) HC Kitchen Sink, Double Bowl: Dayton GE-23321 stainless steel, 33"x21.25" overall size, 14"x15.75"x5.375" deep bowls, 4 faucet holes on 4" centers, fully sound deadened. Drain shall be located in upper left or right corner of bowl.

1. Faucet: Chicago Model 2301-8, single handle, 2.0 gpm aerator, 10” spout, polished chrome finish, ceramic control cartridge, hose and spray.

2. Strainers: Dayton Model D-1125 with removable basket and neoprene stopper.

3. Sink installation shall be in compliance with the ADA guidelines and ANSI A117.1.

H. (P-6) Shower, Barrier-Free: Aqua-Bath Model IS4136SH, 3/4", one-piece, 37-1/2x37"x84" overall dimensions; 1.5" diameter, stainless steel, wrap-around grab bar, curtain rod, curtain and dome light.

1. Shower Unit: Symmons Temptrol 2000 packaged unit. Pressure balancing mixing valve with lever handle, adjustable stop screw, wall/hand shower (2.5 GPM), flexible metal hose, and 30" slide bar for hand shower mounting.

I. (P-6A) Shower, Barrier-Free: Aqua-Bath Model C4136BF-FUS, 3/4", one-piece, with fold down seat, 37"x38.5"x82.75" overall dimensions; 1.5" diameter, stainless steel, wrap-around grab bar, collapsible threshold, weighted shower curtain, curtain rod and dome light.

1. Shower Unit: Symmons Temptrol 2000 packaged unit. Pressure balancing mixing valve with lever handle, adjustable stop screw, wall/hand shower (2.5 GPM), flexible metal hose, and 30" slide bar for hand shower mounting.

2. Installation of shower and accessories shall meet ADA guidelines and ANSI A117.1.

J. (P-7) Mop Service Sink: Powers-Fiat MSB-2424, molded stone, 24"x24"x10" with 1" wide shoulders; 3" stainless steel drain with combination dome strainer and lint basket.

1. Faucet: Chicago Faucets, chrome-plated with vacuum breaker, integral stops, adjustable wall brace, pail hook, and 3/4" hose thread on spout.

2. Hose and Hose Bracket: Powers-Fiat #832-AA, 30" long heavy duty, 5/8" size, cloth reinforced, rubber hose with 3/4" chrome coupling at one end; 5"x3", 18 gauge, stainless steel bracket with rubber grip.

3. Caulk around sink at floor and walls with white silicone caulk.

K. (P-8) Washing Machine Supply and Drain: In-wall, concealed type, Guy Gray Model WB200 for 2" drain, 16 gauge steel, equipped with Watts "Duo-cloz" ball valve to provide simultaneous control of hot and cold water.

2.05 MISCELLANEOUS EQUIPMENT

A. Floor Drain (FD-1): Zurn Z-415, cast iron body with 2" or 3" bottom outlet, combination invertible membrane clamp and adjustable collar.

1. Strainer: 6"diameter Zurn "Type B", polished nickel-bronze.

B. Floor/Yard Cleanout (FCO/YCO): Zurn Z-1400 adjustable floor cleanout, cast iron body, with gas and watertight ABS tapered thread plug. Provide size equal to piping served with maximum size of 4".

1. Concrete floor finishes: Scoriated round polished bronze top.

2. Sheet tile finishes: Scoriated square polished bronze top recessed to receive tile.

3. Carpeted finishes: Scoriated round polished bronze top and carpet marker.

C. Wall Cleanout (WCO): Sanitary tee with threaded raised nut or countersunk-nut cleanout plug located behind Zurn Z-1468 round stainless steel wall access cover.

D. Vacuum Breaker: Watts Model N36, 3/4" size, 20 CFM capacity.

E. Strainer: Watts Series 777, MIL-S-16293, bronze body wye-type, 200 WOG rating, screwed end connections, 20 mesh stainless steel, monel, or bronze screen.

F. Backflow Preventor (BFP): Conforming to AWWA C506, FCCHR-USC Manual Section 10, and UL listed. Types, sizes and capacities scheduled.

1. Double Check (DC): Double check backflow assembly with test ports, bronze body with stainless steel springs, corrosion resistant internals, stop and waste ball valves.

2. Atmospheric Double Check (DCA): Double check continuous pressure type with atmospheric port for low hazard applications, 250°F maximum water temperature, bronze body, stainless steel internals with rubber seals and integral strainer.

C. Reduced Pressure Zone (RPZ): Reduced pressure principle type; bronze body with stainless steel internals. Provide bronze body ball valves, test cocks, and air gap fittings.

G. Freezeless Wall Hydrant: Woodford Model 65, 3/4" size, brass body, brass head nut, automatic draining, with loose tee key and vacuum breaker.

H. Thermometers: Trerice Series V80445 or Ashcroft Series 600A-04, vapor actuated, adjustable angle, 4-1/2" diameter face, cast aluminum case, stainless steel ring, glass window, white background dial with black figures, black finished stainless steel pointer, brass movement with bronze bearings, phosphor bronze bourdon tube. Accuracy shall be to within one scale division.

1. Thermowell: Provide with brass thermometer wells projecting a minimum of 2" into the pipe with extension to face of insulation. Provide with heat transfer fluid to fill interstitial space between bulb and well.

2. Range: 30°F to 240°F for domestic hot water systems.

I. Pressure Gauges: Trerice Series 800 or Ashcroft Type 1005, Grade B, 3-1/2" dial, ANSI B40.1, drawn steel case, white background dial with black figures, clear glass window, brass movement, beryllium copper bourdon tube, 0 to 100 PSI range, accuracy shall be within 2% over middle half of scale and 3% over the remainder. Provide with shut off petcock and restrictor.

K. Circulator (inline)(CP): Taco model indicated, pumps shall be inline cartridge-type or close coupled pump of capacity and performance indicated with all bronze construction 125 psig rated working pressure, 200°F maximum water temperature, carbon Ni-resist mechanical seal, flexible coupling, resilient-mount drip-proof sleeve bearing motor. The pumps shall be factory tested, cleaned and painted with machinery enamel. A set of installation instructions shall be included with pump. Provide high efficiency motors if available as an option of the manufacturer. If high efficiency motors are not available as an option of the manufacturer, submit a certification stating same.

L. Water Hammer Arrestor (Shock Absorber): Plumbing and Drainage Institute listed.

Schedule:

"A" - Size #100 PDI - 0-11 Fixture Units
"B" - Size #200 PDI - 12-32 Fixture Units
"C" - Size #300 PDI - 33-60 Fixture Units

M. Trap Primer: Zurn Z-1022 Automatic Trap Primer, all bronze body with integral vacuum breaker, non-liming internal operating assembly with gasketed bronze cover.

N. Vacuum Breaker: Watts Model N36, 3/4" size, 20 CFM capacity.

O. Strainer: Watts Series 777, MIL-S-16293, bronze body wye-type, 200 WOG rating, screwed end connections, 20 mesh stainless steel, monel, or bronze screen.

P. Condensate Pump: Little Giant Model VCC-20-ULS low profile vertical type pumping unit, 5-1/8"Hx12"Lx5"W, ABS plastic construction, polypropylene float switch, safety switch, thermally protected, check valve, 6 foot power cord with 3-prong plug, secondary safety switch for low voltage alarm wiring, 25 GPH at 15 ft. WG, 20 ft WG shutoff head, 1/30 HP, 120V/1PH/60Hz.

Q. Duplex Sump Pump: Goulds Model 3887(2) closed circuit submersible sump pump, 1-1/4" discharge, 1/3HP, 120V/1PH/60Hz, 30 GPM at 15 ft. WG, with built-in overload protection, 10-foot breather-type PVC power cord and grounded plug, and low-level micro pressure

switch with manual test button, 4-inch “off” level, 5-inch “on” level. Provide with SES Series duplex controller with alternator and alarm. Mount pumps in 36" I.D. x 36" deep fiberglass sewage basin with heavy duty steel cover.

R. Elevator Pit Drainage System: Stancor, Inc., Model SE50 “Oil-Minder System”, or approved equal, ½ HP., 3600 RPM, 120V. , 2" discharge with float switch. A NEMA 4X control panel and a self-cleaning, hermetically sealed, stainless steel oil sensing probe shall alarm if oil is sensed. The pump shall be submersible with discharge check valve. The equipment shall be UL-listed.

2.06 WATER HEATING EQUIPMENT

A. Indirect-Fired Water Heater (IFWH): Make, model, and performance as scheduled on Drawings. Provide with ASME rated temperature and pressure relief valve, adjustable thermostat, set to provide 120°F water.

2.07 PIPING, VALVE, AND EQUIPMENT IDENTIFICATION

A. Piping identification: Provide plastic "wrap-around" identification markers indicating flow and fluid flowing for the following:

1. Domestic Hot Water
2. Recirculated Domestic Hot Water
3. Domestic Cold Water
4. Vent Piping
5. Exposed Above-ground Sanitary Drain Piping
6. Gas Piping
7. Condensate Piping

B. Markers shall be placed 30-50 ft. apart for piping in accessible areas.

C. Markers shall be placed outside the pipe insulation and in the most obvious location for viewing.

D. Valve Tags:

1. Attach to each valve a 1-1/2" round or octagonal brass tag with 1/2" indented numerals filled with a durable black compound. In addition to the valve numbers, each tag shall identify the system it controls. Service stop valves exposed in finished areas need not be tagged.

2. Tags shall be securely attached to stems of valves with copper or brass "S" hooks, or chains.

3. Valve charts shall be provided for each piping system and shall consist of schematic drawings of piping layouts, showing and identifying each valve and describing its function. Upon completion of the work, one (1) copy of each chart, sealed to rigid

backboard with clear lacquer placed under glass and framed, shall be hung where directed. Two (2) additional unmounted copies shall be delivered to the Architect.

4. Tags and charts shall be coordinated with Section 15700 Heating System and when completed this work shall have been done sequentially.

E. Equipment Identification: Provide laminated plastic nameplates for equipment, pumps, mixing valves, backflow preventers, and balancing valves. Nameplates shall be laminated 0.125-inch thick melamine plastic conforming to Fed. Spec. L-P-387, black with white center core. Surface shall be a matte finish, corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that plumbing may be installed in strict accordance with pertinent codes and regulations and the reviewed Shop Drawings.

3.02 INSTALLATION OF PIPING

A. Provide and erect in accordance with the best practice of the trade piping shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place piping in proper position to avoid other work and to allow the application of insulation and finish painting to the satisfaction of the Architect.

B. The size and general arrangements, as well as the methods of connecting piping, valves, and equipment, shall be as indicated, or so as to meet the requirements of the Architect.

C. Piping shall be erected so as to provide for the easy and noiseless passage of fluids under working conditions.

D. Install unions to facilitate removal of equipment.

E. Copper pipe shall be reamed to remove burrs.

F. Connections between copper and steel piping shall be made with brass fittings.

G. Solder joints shall be made with lead free solder. Clean surfaces to be soldered and use a paste flux. Wash joints with sodium bicarbonate and water to remove corrosive effects of heated solder paste. Caution: Lead-bearing solder is not permitted.

H. Pipe penetrations through walls, floors and ceilings shall be in accordance with Section 15000 "Supplemental General Mechanical Requirements". Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy.

I. Provide a cleanout in the vertical position at the base of each sanitary and roof drain drop.

J. Sanitary, roof drain and vent piping shall be sized and installed at 1/4" per foot slope or as indicated and in no case less than 1/8" per foot.

3.03 PIPE HANGERS

A. Impact driven studs are prohibited.

B. Copper Tubing: supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Copper Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"
1-1/4"	8'	3/8"
1-1/2"	8'	3/8"
2"	10'	3/8"

C. Cast Iron Pipe: Supported at intervals with rod sizes as follows, double nuts on hangers and on beam clips.

Cast Iron Size	Hanger Intervals	Rod Sizes
1-1/2"	5'	3/8"
2"	5'	3/8"
2-1/2"	5'	1/2"
3"	6'	1/2"
4"	7'	5/8"

D. PVC Pipe: Supported at 4 foot intervals.

E. Verticals: Supported by use of clamp hangers at every story height, and at not more than 6 feet intervals for copper piping 1-1/4" and smaller size.

F. Spring Isolators: All pipe 20' upstream and downstream of pumps.

3.04 CLOSING IN UNINSPECTED WORK

A. General: Cover up or enclose work after it has been properly and completely reviewed.

B. If any of the work is covered or enclosed prior to required inspections and review, uncover the work as required for the test and review. After review, tests and acceptance, repairs and replacements shall be made by the appropriate trades with such materials as necessary for the acceptance by the Architect and at no additional cost to the Owner.

3.05 CLEANUP AND CORROSION PREVENTION

A. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.

B. Fixtures, piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

C. Caulk around fixtures at floor and wall.

D. Before covering is applied to piping systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

3.06 DISINFECTING

A. After the entire potable water system is completed, cleaned and tested, and just before the building is ready to be occupied, disinfect the system as follows: After flushing the mains, introduce a water and chlorine solution for a period of not less than three hours before final flushing of the system.

3.07 TESTS

A. Sanitary soil, waste and vent piping: Fill with water to top of vents, and test as required by Code.

B. Water piping shall be tested to a pressure of 100 lbs. per square inch for at least 30 minutes. Pressure drop in this period shall not exceed two pounds per square inch. Leaks shall be repaired and system retested. Notify Architect 24 hours before test is to be performed.

3.08 INSTRUCTIONS

A. On completion of the project, provide a competent technician to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

* END OF SECTION *

SECTION 15500 - AUTOMATIC FIRE PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to design, install and test a pressurized, fully supervised, wet or dry pipe fire protection system for full building protection in accordance with NFPA, BOCA, and the Owner's insurance underwriter. Areas subject to freezing shall have a dry pipe system, dry pendent or sidewall heads, or glycol-and-water loop per NFPA.

B. The sprinkler systems design shall be based on NFPA13R requirements.

1.2 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.3 QUALIFICATIONS

A. The Fire Protection Work shall be performed by a qualified Contractor primarily engaged in the design and installation of Fire Protection Systems. The fire protection system design shall be performed under the direction of, and sealed by, a professional engineer registered in the State of Maine.

B. Welding qualifications of individuals installing welded piping shall be certified by the National Certified Welding Bureau for the type(s) of weld(s) proposed for use in piping assembly.

1.4 SUBMITTALS

A. Items for which the submittal requirements of section 15000, Supplemental Mechanical General Requirements, apply are as Follows:

1. Hydrant flow test.
2. System components.
3. Hydraulic calculations.
4. Piping layout, details and control diagram.
5. Flushing and testing records.
6. Certificate of installation.
7. Copy of Fire Protection Contractors License.
8. Welding certificates of individual welding technicians.
9. Sprinkler heads.
10. Alarm valve(s).
11. Fire department connection(s).

12. Firestopping materials and methods.

Submit hydrant flow test, equipment descriptive data, hydraulic calculations and system layout for review by the Owner's Insurance Underwriter. Submit the system layout to the Architect for review. The Architect's review will be limited to checking for conformance with the design concept of the project and general compliance with the contract documents and will in no way assume liability for review for compliance with codes, standards and laws.

1.5 SPRINKLER COVERAGE

A. Sprinkler head coverage shall conform with NFPA requirements for the use of the building. Coverage shall be increased accordingly where required by the Authority having jurisdiction.

B. If the requirements of the inspection agency or the Owner's insuring agent are more rigorous than those stated herein, then the more rigorous requirements shall govern.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS AND HARDWARE

A. Pipe, Fittings, Joints, Hangers, Valves, Fire Department Connections, Alarms: Conform to NFPA-13, Installation of Sprinkler Systems.

B. Sprinkler Heads:

1. Interior Heated Spaces: Conform to NFPA-13R, commercial quick response type. Provide semi-recessed type with white finish for acoustical tile ceilings. Sprinkler heads in GWB ceilings shall be “concealed” type. Dry pendent or sidewall heads, where required, may be standard response type.

2. Provide a spare head cabinet with wrenches and six(6) heads of each orifice size, finish, temperature classification, pattern and length furnished in the project.

3. Provide head protection guards where required.

4. Sprinkler heads in unheated areas shall be dry pendent or sidewall type, or served by a glycol and water loop or separate dry-pipe system.

C. Fire Department Connection: Provide a 4" Storz connection or siamese connection (as verified with the local fire department) at a location coordinated with the local fire department and the Architect.

2.2 WATER SUPPLIES

A. The sprinkler water service shall be cement-lined ductile iron and conform to the requirements of NFPA-13, Installation of Sprinkler Systems.

2.3 DEVICES

A. Detection devices and associated wiring both within the fire protection system and to the building Fire Alarm System shall be the responsibility of the Sprinkler Contractor.

2.4 BACKFLOW PREVENTER

A. Provide AMES MODEL 2000.

2.5 PIPING SYSTEM IDENTIFICATION

A. Piping system and valve identification and color coding shall be in accordance with ANSI.

PART 3 - EXECUTION

3.1 PIPING LAYOUT AND DESIGN

A. System requirements, installation requirements, design, plans, and calculations: Conform to NFPA-13, Installation of Sprinkler Systems.

B. Sprinkler piping shall be run concealed above ceilings in occupied areas. Piping in other areas may be run exposed. Piping shall not be exposed in occupied spaces unless indicated on the drawings.

C. Pipe penetrations through walls and floors shall be in accordance with Section 15000 - Supplemental Mechanical General Requirements. Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy. Penetrations through walls shall be sleeved in accordance with Section 15000. Sleeves shall be provided by the Fire Protection Contractor.

D. Coordinate design and layout with building structure and building systems. The work shown in the contract documents has precedence for space requirements. Work of other trades may be modified or moved only with permission of the trade involved. Costs associated with modifications or relocations shall be the same as for "Substitutions" Section 15000.

E. Architect shall review proposed system layout and reserve the right to relocate heads, substitute head system and in general review final layout for components visible in occupied spaces.

3.2 SYSTEM ACCEPTANCE

A. Approval, flushing, hydrostatic testing, instructions, and certificates of installation: Conform to NFPA-13, Installation of Sprinkler Systems.

B. Disinfect the water piping in accordance with AWWA C601. Fill the piping systems with solution containing a minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Repeat disinfection if chlorine residual is less than 10

parts per million after 24 hours. Flush the solution from the systems with clean water until maximum residual chlorine contents is not greater than 0.2 parts per million.

C. Closing in Work:

1. General: Cover up or enclose work after it has been properly and completely reviewed.

2. No additional cost to the Owner will be allowed for uncovering and recovering, work that is covered or enclosed prior to required review and acceptance.

D. Cleanup and Corrosion Prevention:

1. Upon completion of the work thoroughly clean and flush piping systems to the sewer with water.

2. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

3. Before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

E. Instructions: On completion of the project, provide a technician familiar with the system to thoroughly instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner.

F. Warranty: For a period of one (1) year after completion of the installation repair or replace any defective materials or workmanship. Upon completion of the installation, the system shall be turned over to the Owner fully inspected and tested, and in operational condition.

3.3 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07840 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 15700 - HVAC SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the heating and ventilating systems indicated.

1.02 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.03 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 15000, Supplemental Mechanical General Requirements, apply are as follows:

1. Piping materials.
2. Fittings for steel pipe.
3. Hangers.
4. Valves.
5. Piping, valve and equipment identification.
6. Hydronic specialties.
7. Gas-Fired boiler/burner units.
8. Breeching.
9. Finned tube radiation.
10. Unit heaters/cabinet unit heaters/wall heaters.
11. Fans.
12. Energy recovery ventilators.
13. Unit ventilator.
14. Circulating pumps.
15. Split system air conditioning units.
16. Condensing units.
17. Heating coils.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Hot Water Heating Piping: Type L hard copper tubing and cast bronze or wrought copper solder fittings or Schedule 40 carbon steel pipe with threaded joints and malleable iron fittings, or Schedule 40 carbon steel pipe with rolled or cut grooves and rigid couplings or flexible coupling where required for expansion, or Schedule 05 carbon steel pipe up to 2" with the Victaulic "Pressfit" fitting system.

2.02 FITTINGS FOR STEEL PIPE

A. Fittings in sizes 1/2" through 2": Steel or malleable iron with requirements as follows:

1. Steel fittings socket welding or screwed type conforming to ANSI B16.11.

2. Malleable iron fittings screwed type conforming to ANSI B16.3.

3. Victaulic rolled or cut grooves with rigid couplings and flexible couplings where required for expansion.

B. Fittings in sizes 2-1/2" and larger:

1. Butt welding type conforming to ANSI B16.9.

2. Flanged type conforming to ANSI B16.5.

3. Victaulic rolled or cut grooves with rigid coupling and flexible couplings where required for expansion.

C. Steel Flanges: Forged steel, welding type conforming to ANSI B16.5. Bolting and gaskets shall be as follows:

1. Bolting: Material used for bolts and studs shall conform to ASTM A 307, Grade B, and material for nuts shall conform to ASTM A 194, Grade 2. Dimensions of bolts, studs, and nuts shall conform to ANSI B18.2.1 and ANSI B18.2.2 with threads conforming to ANSI B1.1 coarse type, with Class 2A fit for bolts and studs, and Class 2B fit for nuts. Bolts or bolt-studs shall extend completely through the nuts.

2. Gaskets: Gasket material for flanged joints for steam application under saturated conditions shall be composition asbestos or copper. Gaskets shall be of a material that resists attack by the fluid or gas in the pipeline and shall be suitable for the pressure and temperature ranges encountered. Gaskets shall be as thin as the finish of surfaces will permit. Raised-face steel flanges shall have ring gaskets with an outside diameter extending to the inside of the bolt holes. Gaskets shall have an inside diameter equal to or larger than the port openings.

D. Butt Weld Joints: Shall conform to ANSI B31.1. The use of backing rings shall conform to ANSI B31.1. Ferrous rings shall be of weldable quality and shall not exceed 0.05 percent sulfur. Backing rings shall be of the continuous machined or split band type.

E. Grooved Joint Couplings: Couplings shall be self centering and shall engage and lock in place the grooved or shouldered ends of pipe and pipe fittings in a positive watertight couple. The couplings shall provide some degree of angular pipe deflection, contractions, and expansion. The coupling clamp shall be malleable iron conforming to ASTM A 536, Grade 65-45-12. The gasket shall be molded rubber conforming to ASTM D 2000, the "line call-out" number shall be suitable for a water temperature of 230 degrees F. Coupling nuts and bolts shall be steel conforming to ASTM A 183. Grooved fittings shall be malleable iron conforming to ASTM A47, Grade 32510 or ductile iron conforming to ASTM A 536, Grade 65-45-12. Mechanical couplings and fittings shall be of the same manufacturer. Before couplings are assembled, pipe ends and outside of gaskets shall be lightly coated with lubricant approved by the coupling manufacturer to facilitate installation.

2.03 HANGERS

A. Adjustable Swivel Hanger: Pipe Sizes 2" and Less: Carpenter and Paterson Fig. 800 conforming to MSS-SP-58, oversize for insulated piping systems. Pipe Sizes Larger Than 2": Carpenter and Paterson Fig. 100, oversize for insulated piping systems.

B. Riser Clamp: Carpenter and Paterson Fig. 126 and Fig. 126 CT conforming to MSS-SP-58, provide copper plated clamps on copper pipes.

C. Insulation Shields: 18 ga. galvanized steel, 180^{o} wrap, Carpenter and Paterson Fig. 265P, Type H.

D. All piping 20' upstream and downstream of pumps shall also have Mason Industries PC30N precompressed double deflection spring isolators installed.

2.04 VALVES

A. Ball Valves: Apollo 70-200 Series, bronze body, Fed. Spec. WW-V-35, Type II, Class A (bronze), Style 3, blow-out proof stem, 600 pound W.O.G., screwed connection for steel pipe, sweat connection for copper tube. Provide stem extension to allow operation without interfering with pipe insulation.

B. Gate Valves: Nibco Model S-113 or T-113, bronze body Fed. Spec. WW-V-54, wedge disc, rising stem, screwed connection for steel pipe, sweat connection for copper tube, 150-pound class.

C. Check Valves: Nibco Model S-413 or T-413, bronze body Fed. Spec. WW-V-51, regrinding swing check type, 200 pound class.

D. Butterfly Valves: Centerline or Norris, valves shall conform with MSS-SP67, Type I 150 psig - Tight shut off valve, ends shall be flangeless or grooved, cast iron body, type 300 series

corrosion resistant steel stems and corrosion resistant or bronze discs with molded elastomer disc seals. Valves shall have throttling handles with a minimum of 7 locking positions. Valves shall be suitable for water temperatures up to 220 degrees F.

2.05 PIPING, VALVE AND EQUIPMENT IDENTIFICATION

A. Pipe Identification: Provide plastic "wrap around" identification markers indicating flow direction and fluid flowing for the following:

Hot Water Supply Piping
Hot Water Return Piping

1. Markers shall be placed 30-50 ft. apart for piping in accessible areas.

2. Markers shall be placed outside the pipe insulation and in the most obvious location for viewing. Markers shall not be installed in exposed areas except in the mechanical rooms.

B. Valve Tags:

1. Attach to each valve a 1-1/2" round or octagonal brass tag with 1/2" indented numerals filled with a durable black compound. In addition to the valve numbers, each tag shall identify the system it controls. Service stop valves exposed in finished areas need not be tagged.

2. Tags shall be securely attached to stems of valves with copper or brass "S" hooks, or chains.

3. Valve charts shall be provided for each piping system and shall consist of schematic drawings of piping layouts, showing and identifying each valve and describing its function. Upon completion of the work, one (1) copy of each chart, sealed to rigid backboard with clear lacquer placed under glass and framed, shall be hung where directed. Two (2) additional unmounted copies shall be delivered to the Architect.

4. Tags and charts shall be coordinated with Section 15700 Heating System and when completed this work shall have been done sequentially.

C. Equipment Identification:

1. Provide laminated plastic nameplates for boilers, pumps, and air handling units. Laminated plastic shall be 0.125-inch thick melamine plastic conforming to Fed. Spec. L-P-387, black with white center core. Surface shall be a matte finish, corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 1.0 inch by 2.5 inches. Lettering shall be minimum of 0.25-inch high normal block lettering.

2.06 HYDRONIC SPECIALTIES

A. Thermometers: Trerice Model V80445 or Ashcroft Series 600A-04, dial type , Mil Spec MIL-T-9955, 4-1/2" diameter face. Hot water system thermometers shall have a range of 30°F to 240°F with 2° increments. Provide with brass thermometer wells projecting a minimum of 2" into the pipe with extension to face of insulation. Provide with heat transfer fluid to fill the sealed interstitial space between bulb and well. Evidence of the transfer fluid leaking shall be cause for refilling and sealing the well.

B. Pressure Gauges: Trerice Series 800 or Ashcroft Type 1005, Grade B, ANSI B40.1, 3-1/2" diameter face installed with shut off petcock and restrictor. Pressure range: 0-50 psig with 5 psi graduations, 0-100 psig with 10 psi graduations for chilled water pumps.

C. Expansion Tanks (Captive Air Type) (ET): Taco Model as scheduled, tank shall be of capacity indicated and shall be welded steel, constructed and tested hydrostatically in accordance with Section VIII of the ASME Boiler Pressure Vessel Code. The tank bladder shall be butyl rubber and shall be removable for inspection. Tank shall have air charging and system connections, and shall be factory pressurized.

D. Strainers: Watts Model 77S, MIL-S-16293, 125 psig minimum rating wye strainers, cast iron or bronze body, screen shall be stainless steel, monel or bronze with 20 mesh perforations. Provide with blowdown ball valve and 3/4" hose connection.

E. Automatic Air Vents: Armstrong No. 1-AV, float type to vent air in hydronic systems. Vent constructed with cast iron body and stainless steel internals and with NPT male inlet and outlet for 1/4 inch overflow for safe water connection. 150 psi working pressure, 250°F maximum temperature.

F. Tangential Air Separator (AS): Furnish and install as shown on the drawings a Spirotherm air elimination fitting on the hot water system. All fittings shall be fabricated steel, rated for 150psig design pressure and selected for less than 1 foot of water pressure drop and velocity not to exceed 4 feet per second through the unit at specified GPM. All units shall include an integral copper bundle of Spirotubes to act as the turbulence suppressive coalescing medium which must completely fill the fitting's internal area. Units are to remove free and entrained air during system start up and continue to eliminate dissolved air through continual circulation and the coalescing action of the Spirotubes. Each fitting is to have a separate air and venting chamber to prevent system contaminants from harming the float and venting valve operation. At the top of the venting chamber shall be an integral float actuated brass air vent. There shall be no restriction in the connection from the venting chamber to the vent. The fittings are to include a valved side tap to flush floating dirt or liquids and for quick bleeding of large amounts of air during system fill or refill. Units shall include a bottom connection for use as a blow down connection for periodic cleaning. Unit shall be a Spirovent model of the size required to meet pressure drop and velocity criteria.

G. Manual Air Vents: Brass body, fiber discs, 125 psi working pressure, 240°F maximum temperature, adjustable for quick venting at system start-up.

H. Circulator (inline) (CP): Taco model indicated, pumps shall be inline cartridge-type or close coupled pump of capacity and performance indicated with cast-iron body and bronze-fitted,

175 psig rated working pressure, 220°F maximum water temperature, carbon Ni-resist mechanical seal, flexible coupling, resilient-mounted drip-proof sleeve bearing motor. The pumps shall be factory tested, cleaned, and painted with machinery enamel. A set of installation instructions shall be included with the pump. Provide high efficiency motors if available as an option of the manufacturer. If high efficiency motors are not available as an option of the manufacturer, submit a certification stating same.

I. Manual Circuit Balance Valves: Taco "Accu-Flo".

1. Bronze or brass body and internals, teflon seats, 300 psi working pressure, 250°F working temperature. Balancing devices shall be adjustable and shall have provisions for connecting a portable differential pressure gauge. Each balancing device shall be sized to provide a differential pressure reading between 2 and 5 feet with the valve full open at design flow rates.

2. Install per manufacturer's recommendations for adjacent length of straight pipe.

3. Shop drawings shall indicate gpm, size, wide open differential pressure meter reading, and actual water pressure drop.

4. At the Contractor's option, balancing valves with combination shut-off - balancing - drain provisions may be used in lieu of the individual components indicated. The balancing valve shall be furnished with a memory stop feature so that the valve can be correctly returned to the balance position after serving the stop function

J. Water Pressure Reducing Valve: Watts Regulator series U5LP bronze body, bronze internals, 200 psi working pressure, 200°F maximum temperature, adjustable pressure range 10-25 psig. Provide with inlet strainer (screen).

K. Flexible Connectors at Pumps and at Coils: Multi-layer neoprene-nylon cord fabric twin-sphere connectors with flange ends, rated at 150 psig at 220°F. Sizes 1-1/2" to 2-1/2": 6" long, sizes 3" to 6": 9" long, line size.

L. Temperature and Pressure Test Ports: Peterson Equipment Co. Model 110 "Pete's Plugs" temperature and pressure test capability, brass body, 1/4" NPT fitting, Nordel valve cores, 275°F maximum temperature, 500 psig maximum pressure. Provide with (1) pressure and temperature test kit.

M. Automatic Flow Control Valves: Flow Design, Inc., Autoflow Model AC (up to 2") and Model WS (larger than 2") or approved equal. The valves shall be factory set to maintain the specified flow rates within +/- 5% over an operating range of 2-32 psid. Each valve shall have a five (5) year warranty and free first year cartridge exchange. The internal wear surfaces of the valve cartridge shall be electroless nickel or stainless steel. The valve body shall be forged brass and permanently marked with the flow rate and spring range. Minimum pressure and temperature ratings shall be 400 psig at 250EF. Valve accessories shall include a union, ball valve and integral strainer. Installation shall be in accordance with the manufacturer's recommendations. The ball valve shall have a teflon packing, brass

packing nut and blowout-proof stem, large diameter plated ball and a full size steel handle with vinyl grip.

N. Triple Duty Valve: Taco MPV, cast-iron body, 200 psig rating, lockable in position and incorporating a non-slam silent operating check valve, flow measuring ports and positive shut-off valve with position indication.

O. Batch Chemical/Glycol Feeders: Shall be Griswold Model CBF-20GE, Cemline, Ace or approved equal, 20 gallon minimum capacity, 1" inlet and outlet threaded tappings as required, mild carbon steel construction with primed exterior, 125 psig ASME construction with valved and capped funnel fill and 3/4" drain valve with hose connection. Furnish with valve and pedestal support stand package.

2.07 GAS-FIRED BOILER/BURNER UNITS

A. Boilers shall be pressurized wet base cast iron sectional, type and model indicated. Th manufacturer shall be H.B. Smith, Weil-McLain or Burnham. The rated working pressu shall be 70 psig. The burners shall be on-off control, flame retention type. Ignition shall b direct spark.

B. Primary controls shall include flame detection circuit with manual reset and modulating firi rate controller with fuel-air control. Safety controls shall include a McDonnell-Miller manu reset electronic probe-type low water cut-off, Series 750 (150 psig), 20,000 ohms sensitivi with test switch, NEMA 1 enclosure, and manual and automatic reset high limit aquastats.

C. The boiler/burner units shall be furnished with a factory fabricated burner mounted contr panel (mounted on top of the burner) housing control components and terminal strip includin programming control, service switch, low fire switch, manual reset high limit, fused pow supply and control power transformer. Provide an interface for remote alarms for flam failure and low water. The burner programming control shall provide a fully modulating firi sequence. The burner management / firing rate controller shall be Autoflame Mark V microprocessor-based and specifically designed to maximize the fuel to air ratio.

D. Accessories shall include 70 psig ASME rated pressure relief valves, theraltimeter, operati aquastat, boiler return yoke and barometric dampers.

E. Furnish stack thermometer with stainless steel bulb and 4" minimum scale, range of 50-750°

F. The boiler/burner units shall be started and adjusted by a factory representative who sha submit an efficiency report for Engineer review.

G. Provide firestats, emergency shut-off switches, and service switches as required by NFPA 5

2.08 BREECHINGS

A. Round Breeching: Provide round breechings constructed of 16 gauge black iron or steel accordance with NFPA 211 for metal connectors for low-heat appliances and constructed wi welded seams and joints.

1. Round breechings also may consist of approved factory-built chimney sections f low-heat appliances if the sections are jointed together with flanges.

2. Suitable cleanouts shall be provided that will permit cleaning the entire breechi without dismantling.

B. Cleanout Doors: Provide cleanout doors secured to the ends and sides of the breeching whe indicated on drawings or where required to effectively clean the breeching.

1. Cleanout door shall be constructed of a gauge steel not less than that of the breechi and shall be secured to a 1-1/4-inch by 1-1/4-inch angle frame not less than 1/8-in in thickness with mounting bolts welded to the angle frame and spaced not over inches on center.

2. Provide 1/16-inch thick long fiber suitable gasket between cleanout doors and frame

3. Doors shall be squared and shall be full height of diameter or side of breeching up a maximum of 24 inches by 24 inches except that cleanout doors less than 12 inch in height shall be rectangular and shall be 12 inches in length.

4. Plug type cleanouts are not acceptable.

2.09 FINNED TUBE RADIATION (FTR-#)

A. Finned tube radiation (FTR) shall be of manufacturer, type, size, and capacity scheduled.

B. Finned Tube Radiation (Wall Hung): Heating elements shall have aluminum fins with integ fin collars mechanically bonded to the tube. Provide element mounting system consisting wall mounted mounting brackets and pipe cradles on 4' centers. Cradles shall run on nyl guides for noiseless operation. Enclosures shall be 18 gage steel, shall be continuous, and sh mount to a continuous channel mounting strip at the top of the enclosure. The bottom of t enclosure shall fasten to the pipe mounting brackets. Provide a continuous urethane gask between the top mounting channel and the wall to prevent dust streaking. Provide end cap corner pieces, access panels and enclosure extensions as required. Provide factory enam finish - color by Architect.

2.10 UNIT HEATER (UH-#)

A. Horizontal unit heaters shall be manufactured by the Trane Co., McQuay, Sterling or Americ Air Filter. Coils shall be copper tube mechanically expanded into aluminum fins and pressu rated at 200 psig at 250F. Fans shall consist of a single blower. Coils shall be certified accordance with ARI Standard 410. Casings shall be galvanized steel. Cabinets shall be fini painted in a factory-applied baked enamel.

B. Furnish with factory-mounted disconnect switch.

2.11 FANS (SF-#, EF-#)

A. Shall be model indicated. The fan shall include housing, fan wheel, shaft, bearings, inlet shrou motor, mounting support and mounting frame as a factory-assembled unit. An OSH approved belt guard shall be included. The fan drive shall have a 1.5 service factor for t maximum rated horsepower. Each fan shall incorporate a backdraft damper or one shall b installed at the discharge (louver).

B. Bearings shall be precision, flange-mounted self-aligning ball bearings at inlet and discharg Grease lines shall extend to the exterior of the fan housing.

C. Submit sound power data for inlet and discharge sound.

D. Submit fan curves for each fan with the design operating point clearly marked.

E. Furnish accessories as noted on drawings.

2.12 CABINET UNIT HEATERS (CUH-#)

A. Construction:

1. Cabinet unit heaters shall be manufactured by the Trane Co., Sterling, Vulcan American Air Filter. Unit configuration shall be inverted airflow, wall-mounted floor-mounted as indicated. Cabinets shall be surface-mounted, semi-recessed fully-recessed, as indicated. Coils shall be copper tube mechanically expanded in aluminum fins and pressure rated at 200 psig at 250F. Fans shall consist of multip squirrel cage blowers on a common shaft. Coils shall be certified in accordance wi ARI Standard 410. Casings shall be galvanized steel. Cabinets shall be finish paint in a factory-applied baked enamel with color selection by the Architect.

2. Furnish units with a 3-speed fan switch, disconnect switch and throwaway dust filt (with 2 spare sets per unit).

B. Performance:

1. Performance and capacity shall be as scheduled.

2.13 WALL HEATER (WH-#)

A. Wall heater shall be VRV Products Model 2004KSWK, Beacon-Morris, or Embassy, capaci scheduled on drawings. Wall heaters shall be 120V with pipe mounted aquastat, fully recess and painted with an enamel paint (color by architect).

2.14 SPLIT SYSTEM AIR CONDITIONING UNIT (SAC-# and CU-#)

A. The split system air conditioning unit shall be Mitsubishi “PK” Series wall mounted indoor uni with vertical outdoor units, or approved equal by Sanyo. Cooling capacity shall be scheduled. The indoor unit shall operate on 120V. and the outdoor unit shall operate on 208V 1 phase power. Furnish with refrigerant piping, wiring and condensate piping as recommend by the manufacturer. The air conditioning units shall be suitable for operation at 0ºF. outsi ambient. Units must be suitable for use with the refrigerant line lengths required by the un placement as shown on the plans with no reduction in capacity.

2.15 TOTAL ENERGY HEAT RECOVERY EQUIPMENT (ERV-#)

A. Shall be Greenheck, AEX, Semco, DesChamps, or approved equal, with capacities an performance as scheduled. The heat recovery equipment shall be a factory assembled an tested package, constructed and rated in accordance with ARI, AMCA and UL. Syste components shall include fan(s), air-to-air heat exchangers, dampers, hot water heating co filter sections, drain pans, motor starters, defrost system, welded structural steel base, roof cu (where applicable), non-fused disconnect switches and double-wall, insulated airtight casi with interior sheetmetal liner. The casing shall have 1" thick (minimum) 3.0 pcf fibergla thermal insulation. A minimum of ten (10) feet of separation shall be provided between th outside air intake and exhaust outlet. Floor openings shall have safety grates.

B. The air-to-air “total energy” heat recovery units shall be a rotating enthalpy wheel (molecul sieve design or desiccant) or static plate core capable of sensible and latent energy transfe Rotating wheel exchangers and drives shall include a purge section and a five (5) ye replacement warranty for materials and labor. The exterior casing shall be constructed galvanized steel, weathertight, phosphatized and painted with a finish coat of epoxy pai (Greenheck “Permatector”, or approved equal).

C. Fans shall be DWDI forward curved or airfoil blade or plenum fan with variable pitch be drives selected at 1.5 times the maximum rated motor horsepower. Motors shall be mount on an adjustable slide base. Motors shall be premium high efficiency, inverter-duty rated. F bearings shall be regreasable tapered roller pillow block bearings with an L10 life of 200,0 hours. Provide extended lubrication lines for each bearing. Fans shall have seismic rated static deflection spring vibration isolators. All serviceable components shall be readi accessible via hinged (stainless steel) and latched fully gasketted quick release access doo

D. Supply and exhaust prefilters shall be 2" thick, 30-35% efficient extended surface pleat media disposable type by Farr, or approved equal. Furnish a total of three (3) complete se of filters for each filter bank. Provide Dwyer “Magnehelic” differential air pressure gaug across each filter bank.

E. Drain pans shall be insulated double-sloped stainless steel with drain connections. Provisio shall be made for bypassing the heat exchanger, reducing the speed of the wheel or otherwi reducing the recovered heat on a call for cooling of the supply airstream (economizer cycle

F. Dampers shall be galvanized steel, airfoil blade, Ruskin Model CD60, or approved equal, "ult low leak" type. Blade seals shall be neoprene and jamb seals shall be compressible aluminu

or stainless steel. Motorized backdraft dampers and actuators with end switches shall b provided for the supply and exhaust fans. Intake and exhaust weatherhoods shall be provide

G. Electrical work shall be in accordance with the National Electrical Code (NFPA 70) and sha include motor starters, junction boxes, duplex weatherproof GFCI receptacles, and vapor-tig marine lights in each compartment. Provide switches with pilot lights. Wiring shall be galvanized steel or liquidtight conduit. A single point electrical connection shall be provide

H. Controls shall include the following: enthalpy controller, wheel rotation sensor, modulati wheel frost control, dirty filter sensor for outdoor and exhaust filters

I. The heat recovery units shall be started up and their operation verified by an authoriz representative of the equipment manufacturer and the commissioning agent during th commissioning process.

J. Coils: Capacities and pressure drops shall be rated in accordance with ARI 410. Coils sha be pressure tested at 300 psig and shall be suitable for 150 psig service.

1. Heating and Cooling Coils: Copper tubes, aluminum fins and copper headers. Casing shall be 16 gage galvanized steel.

2.16 UNIT VENTILATORS (UV-#)

B. Unit ventilators shall be AAF with arrangement, performance and accessories indicated.

C. The unit ventilator shall include a cabinet, fans, motor, power disconnect switch, heating co DX cooling coil, filters, face and bypass dampers, sheet metal sleeve connecting outside louv to back of unit, insulated adapter back, and outside air louver as scheduled on the drawings

D. Cabinet: Shall be constructed of 18 gage steel, welded construction, with phosphatizi treatment, and primer. Provide duct collars for ceiling mounted units as indicated.

E. Fans and Motors: Fans and housings shall be of fabricated steel construction; plastic ar fiberglass construction is not acceptable. Fan and motor assemblies shall be of the direct driv type mounted on a hollow steel shaft with full size sleeve type end bearing. The shaft shall b connected through a flexible coupling to a multi-speed, permanent split capacitor. The mot and fan rotating element shall be isolated from the unit with neoprene rubber mounts. Mot shall be provided with integral auto reset thermal overload protection and safety switch.

F. Heating Coils: Copper tubes and aluminum fins. Joints shall be brazed with high temperatu corrosion resistant alloy. Headers shall be supplied with provision for installation of 1/8" NP vent and drain. Supply and return shall be same end connection.

G. Dampers: Provide an outdoor air damper/return air damper. Provide damper seals on bo sides and edges. A divider shall be placed between the damper blades to separate the fre air and return air compartments to prevent blow-through. Dampers shall pivot in se lubricating nylon bushings. Provide a heating coil face and bypass damper. The damper sha

be "double-sheathed" construction and shall contain a dead air space to prevent heat pickup b
radiation. Baffles shall be provided between the fan scrolls to prevent mixing of bypassed a
with air in contact with the coil.

H. Cooling Coils: Copper tubes and aluminum fins, direct expansion type.

I. Accessories:

1. Provide one (1) set of throwaway filters.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades an verify that such work is complete to the point where this installation may proper commence.

2. Verify that the heating system may be installed in accordance with pertinent codes an regulations and the reviewed Submittals.

3.02 INSTALLATION OF PIPING

A. In general, piping shall be run concealed above ceilings in occupied areas. Piping in other are may be run exposed. Piping shall not be exposed in occupied spaces unless writt authorization is given by the Architect.

B. Provide and erect in accordance with the best practice of the trade piping shown on th Drawings and as required to complete the intended installation. Make offsets as shown required to place piping in proper position to avoid other work and to allow the application insulation and finish painting to the satisfaction of the Architect.

C. The size and general arrangements, as well as the methods of connecting piping, valves, an equipment, shall be as indicated, or so as to meet the requirements of the Architect.

D. Piping shall be erected so as to provide for the easy and noiseless passage of heating flu under working conditions. Inverted eccentric reducing fittings shall be used whenever wat pipes reduce in size.

E. Water mains shall be run level or pitch slightly upward so that no air pockets are formed in th piping. The mains shall be set at elevations such that the runouts feeding equipment shall hav no pockets where air can collect except where vents are provided. Provide drains at lo points in the piping systems.

F. High points in water piping shall be provided with manual vents.

G. In the erection of water piping, make proper allowances for expansion and contraction. Pipin shall be anchored as necessary to control expansion. Hot water runouts to units shall be th size as indicated on the Drawings and shall come off the main downward or off the side wi a minimum of two 90^{o} elbows provided on runout from main.

H. Install stop valves and unions to facilitate isolation and removal of equipment. Provide fin connections for hydronic specialties furnished under other sections of the Specifications.

I. Steel piping with screwed connections. Threads on piping shall be full length and clean-c with inside edges reamed smooth to the full inside bore. Close nipples shall not be used. Pi threads: standard pipe threads, machine cut and full length. Pipe: reamed to remove burrs a up-ended and rapped to dislodge dirt and scale. Joint compound shall be applied to male thre only. If it is necessary to back off a screwed joint after it is made, the thread shall be clean and new compound applied. Caulked threads will not be permitted.

J. Connections between copper and steel piping shall be made with bronze fittings.

K. Install thermometer wells for temperature gauges and sensors, projecting a minimum of 2" in the pipe with extension to face of insulation. Piping 1-1/2" and smaller shall be enlarged to where wells are installed. Wells shall be installed in active sections of piping. Fill wells wi heat transfer fluid.

L. Solder joints shall be made with non-lead solder. Clean surfaces to be soldered and use a pas flux. Wash joints with sodium bicarbonate and water to remove corrosive effects of heat solder paste. Hot wipe solder at each fitting.

M. PVC piping shall have solvent welded joints except at connections to equipment and valv which shall be screwed for sizes 2" and smaller and flanged for sizes 2-1/2" and large Solvent welded joints: Pipe ends deburred, and beveled. Pipe end and fitting: Cleaned a dried, primed to soften bonding surfaces. Pipe end: Apply even full layer of solvent ceme after priming. Before cement starts to set, insert pipe end into fitting and turn 1/4 turn evenly distribute cement. Hold joint together until cement sets-up, wipe excess cement o joint.

N. Pipe penetrations through walls, floors and ceilings shall be in accordance with Section 150 "Supplemental Mechanical General Requirements". Traverse points of piping shall b escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible occupancy.

O. Automatic Air Vents: Shall be installed with a manual isolation valve. The vent discharge sha be piped to a local floor drain.

3.03 PIPE HANGERS

A. Impact driven studs are not acceptable.

B. Pipes (copper or steel) shall be supported at intervals and rod sizes as follows, double nuts o hangers and on beam clips.

Pipe Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	7'	3/8"
1-1/4"	8'	3/8"
1-1/2"	9'	3/8"

2"	10'	3/8"
2-1/2"	11'	1/2"
3"	12'	1/2"

C. Verticals: Supported at the base and at intervals as follows by use of clamp hangers:

Steel Pipe: Not more than 16 ft.

Copper Pipe and Tubing:

1-1/2" and larger - Not more than 12 ft.
1-1/4" and smaller - Not more than 6 ft.

D. Provide welded steel saddles at each hanger on steel piping systems 4" and larger.

E. PVC Piping: Supported at 4' intervals.

F. Spring Isolators: All piping within 20' upstream and downstream of the pumps.

3.04 INSTALLATION OF BOILERS

A. Assemble boiler sections, jacketing, burner, combustion controls, operating controls, and safe controls per NFPA-54 and manufacturer's instructions. Provide boiler interconnecting pow and control wiring. Hydrostatically test the boiler for leaks prior to installation of jacketin Repair leaks and retest as required.

B. The boiler/burner units shall be started and adjusted by a factory representative in the presen of the Architect. The factory representative shall provide a field efficiency report to th Engineer at the completion of the start-up. The report shall include, but not be limited to:

1. Burner nozzle type, spray pattern, spray angle, mbh per hour rating.
2. CO_2 reading (%).
3. Stack draft (in W.G.).
4. Smoke test number (<#2 Bachrach).
5. Stack temperature, room temperature.
6. Combustion efficiency (%).

Incorporate the field test results in the "Operations and Maintenance" manuals.

C. Charge hot water heating system with corrosion inhibitor per manufacturer's recommendation Concentrations shall be based on a system temperature of 220°F and shall be the high end the manufacturer's recommended concentration range.

3.05 CLOSING IN WORK

A. Cover up or enclose work after it has been properly and completely tested and reviewed.

B. No additional cost to the Owner will be allowed for uncovering or recovering any work th is covered or enclosed prior to required test and review.

3.06 TEST AND ADJUST

A. Piping Systems: Test with water to a pressure of 75 psi and hold for a period of two hou Repair any leaks and retest the piping system; repeat process until systems are leak-free. Te piping before it is insulated.

B. Before operating any system, flush the piping to remove oil and foreign materials.

C. After the installation is complete and ready for operation, test the system under norm operating conditions in the presence of the Architect and demonstrate that the system functio as designed.

D. Demonstrate that the HVAC systems have free and noiseless circulation of water, that all a has been purged and that systems are watertight.

E. Correct defects which develop in operational testing, conduct additional testing until defect fr operation is achieved.

F. Provide balancing and adjusting of terminal devices in accordance with Specification Secti 15990.

3.07 CLEANUP AND CORROSION PREVENTION

A. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed a the premises left in a clean and neat condition.

B. Before covering is applied to piping systems, clips, rods, clevises and other hanger attachmen and before uncovered piping is permitted to be concealed, corrosion and rust shall be wi brushed and cleaned and in the case of iron products, a coat of approved protective pai applied to these surfaces. When corrosion is from the effects of hot solder paste, the are shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutraliz the acid condition.

3.08 INSTRUCTIONS

A. On completion of the project, instruct the Owner's representative in the care and operation the system. The total period of instruction shall not exceed four (4) hours per building. Th time of instruction shall be arranged with the Owner. In addition to the prime Mechanic Contractor, the control system Contractor, Balancing Contractor, and Owner's representati shall be present and participate in the Owner's instruction.

* END OF SECTION *

SECTION 15800 - DUCTWORK AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.2 DESCRIPTION OF WORK

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the ductwork systems indicated.

1.3 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.

B. The items for which the submittals paragraph in Section 15000, Supplemental General Mechanical Requirements, apply are as follows:

1. Ductwork.
2. Ductwork accessories.
3. Air devices.
4. Firestopping materials and methods.
5. Louvers and dampers.
6. Ductwork sealing products.

PART 2 PRODUCTS

2.1 DUCTWORK

A. Classification of Ductwork: Low pressure ductwork: up to 2" W.G. static pressure. Medium pressure ductwork: 2" to 6" W.G. static pressure. All flat oval and round ductwork shall be of medium pressure construction. The duct pressure class shall be determined by multiplying the total static pressure scheduled in the fan schedules by 1.2.

B. Materials: Unless otherwise indicated low pressure ductwork shall be galvanized steel. Galvanized sheet metal shall be new galvanized steel sheets of lock forming quality with zinc coating that will not flake or peel under forming operation.

C. Construction for Low Pressure Round and Rectangular Ductwork:

1. Material: Galvanized steel conforming to ASTM A527, weight of galvanized coating shall be not less than 1-1/4 ounces total for both sides of one sq.ft. of a sheet. Construction, metal gage, and reinforcements shall conform with SMACNA "Duct Construction Standards" and NFPA 90A for 2" W.G. pressure class.

2. Fittings: Shall be constructed in accordance with SMACNA Standards and shall be of the types indicated (ONLY).

3. Longitudinal joints shall be Pittsburgh lockseam (ONLY). Button punch snap locks are not acceptable.

4. Joints shall be sealed to SMACNA seal class B.

D. Construction for Spiral Seam Round and Flat Oval Ductwork:

1. Ductwork and fittings shall be United McGill Uni-seal or Uni-rib, Eastern Sheetmetal, Semco or Monroe Sheetmetal, galvanized steel, factory fabricated, spiral lockseam or welded longitudinal seam, round or flat oval type, as indicated. Ducts and fittings shall be specifically designed for medium pressure application. Round or flat oval ductwork indicated as acoustically lined shall be United McGill Acousti-K27, double wall medium pressure construction with perforated inner liner and 1" thick fiberglass insulation. Liner perforations shall be 3/32" diameter spaced for 23% open area. Fittings shall be furnished with solid liners. Insulation shall be provided with thermal conductivity of 0.27 BTU/HR-^{o}F-FT^{2}-IN. Exposed ductwork in finished spaces specified to be painted shall be “Paint-Grip” galvanized material. Interior ductwork shall be constructed of galvanized sheetmetal. Exterior ductwork shall be constructed of aluminum sheetmetal.

   a. Sheetmetal Gauges: Per SMACNA for listed pressure class.

   b. Fittings: Fittings shall be machine formed type or welded multi-segment type. All seams shall be factory sealed or welded airtight. Tap offs shall be 90^{o} conical type or 45^{o} standard type, with smooth, machine formed entrance, designed for low pressure drop and low noise generation. 90^{o} elbows shall be 5 piece construction (where space permits) or vaned type mitered elbow where space is restricted. Unless specifically indicated (and field-verified) as 5 piece construction, use vaned 90^{o} elbows. Vanes shall be single thickness, solid-welded in place.

   c. Joints on round spiral ductwork shall be slip type, coupling type, Van Stone flanges, or factory fabricated flange system type connectors, as standard with the manufacturer. Flat oval joints shall be Van Stone flanges (gasketed) or factory fabricated flange system type connectors. Joints shall be made up with joint sealer applied in strict accordance with the manufacturer's recommendations. Joint sealer shall be as recommended by the manufacturer.

d. Duct and fittings shall have been tested for air friction loss and leakage in an independent testing laboratory. Test results shall be submitted with the Shop Drawings for review.

e. External reinforcing angles shall be provided in accordance with the manufacturer's recommendations. External reinforcing angles shall be galvanized or painted with a rust inhibiting aluminum paint. Include reinforcing data with Shop Drawing submittal. Duct and reinforcing shall be designed for a positive static pressure of 6 inches of water gage.

f. No internal tie rod reinforcing will be allowed.

g. Hangers shall be of the clamp-on or trapeze type. Exposed ductwork shall use clamp-on hangers only. Holes shall not be drilled through the ducts.

F. Boiler Breeching: The breeching shall be 16 gauge welded black carbon steel with bolted and gasketted cleanouts, per BOCA.

2.2 DUCTWORK ACCESSORIES

A. Access Doors:

1. Medium Pressure Duct Systems: Ruskin Model ADHP-3, 12"x12" size, 16 gauge galvanized steel, foam gasket, insulated door, spring latches.

2. Low Pressure Duct Systems: Ruskin Model ADC2, 12"x12" size, 24 gauge galvanized steel, steel on both sides of door, foam gasket seals, 1" insulation, 2 cam locks, no hinge.

B. Counter Balanced Dampers (CBD): Aluminum frame and blades, extruded vinyl edge seals, 2-1/4" deep, set 0.06" WG.

C. Backdraft Dampers (BDD): Ruskin Model CBD2 or American Warming and Ventilating aluminum frame and blades, extruded vinyl edge seals, field set at 0.10" W.G. pressure differential for full open operation.

D. Fire Dampers: Greenheck FD-series, Ruskin Model IBD2, or Cesco, curtain type, 100% free area (ONLY), Style C for round duct installations, and Style B for rectangular duct applications. Fire dampers located immediately behind transfer grilles may be Style A dampers. The dampers shall be UL rated for 1-1/2 hours and have a 165°F fusible link. Fire dampers shall comply with UL “Standard for Safety” 555.

E. Flexible Duct Connections: Ventfabrics, Inc. neoprene coated glass fabric.

F. Drawbands for Flexible Ducts: Clinch type stainless steel with screwdriver adjustment, or nylon with lever action tightening tool provided by the drawband manufacturer.

G. Turning Vanes: (Low Pressure):

1. Solid blade, mounted with the long edge down stream in accordance with duct construction details indicated. Submit a 12"x12" sample elbow for review prior to fabrication.

G. Volume Dampers:

1. Factory fabricated as specified, or shop fabricated in accordance with SMACNA "HVAC Duct Construction Standards".

2. Rectangular: Ruskin Model MD-35, or American Warming and Ventilating, 12 gauge galvanized steel, locking quadrant, opposed blade over 11", single blade 11" and under.

3. Round: Ruskin Model MDRS25, or American Warming and Ventilating, 20 gauge galvanized steel with locking quadrant(ONLY). Dampers may be provided integral with spin-in fittings.

I. Flexible Ductwork:

1. Low Pressure Duct Systems: Wiremold type WGCF, polyester core with wire helix, 1-1/2" thick, 3/4 lb fiberglass insulation, polyolefin jacket/vapor barrier, 2" W.G. rated pressure.

J. Joint Sealer:

1. Hardcast DT tape and FTA-20 activator.

2. Provide waterproof sealer where watertight seal is specified.

K. Louvers (L): Ruskin Model ELF6375DX, Greenheck, or American Warming and Ventilating. Extruded aluminum construction, 0.081" thick, aluminum extrusions, drainable blade, 1/2" expanded metal bird screen, size and performance as scheduled. AMCA certified leakage rate shall be a maximum of 0.02 ounces of water per square foot of free area at 1000 FPM free area velocity. Provide Kynar 500 finish, color selected by Architect. Provide frame styles compatible with building construction, see architectural details. Provide concealed architectural or standard visible mullions in multi-panel louver assemblies as indicated on the drawings. Inactive / blanked-off louvers shall have a double wall sheetmetal closure on the interior face of the louver. The closure shall have a 2" thickness of 1.5 pcf rigid fiberglass board insulation with a foil face. Both sides of the sheetmetal shall be painted flat black.

2.3 AIR DEVICES (Krueger, Price, Anemostat, Metal Aire, Titus) ONLY

A. Material and Finishes: Construct diffusers, registers, and grilles of aluminum. Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded. Steel parts shall be factory zinc-phosphate treated prior to priming and painting or have a baked-on enamel finish. Aluminum parts shall be finish painted. Provide frame style compatible with ceiling or wall type. Colors shall be selected by Architect. Devices to be installed on exposed duct installations shall be furnished in primer suitable for field application of color coat.

B. Sound Pressure Level: Manufacturer certified sound pressure level rating of inlets and outlets in accordance with ADC 1062 R4. Conform with the permissible room sound pressure level for each device as scheduled.

C. Throw: Defined as distance from the diffuser, register, or grille to the point which the resultant room air velocity is 50 to 35 feet per minute.

D. Ceiling Diffusers: Equip with core styles required to provide air distribution pattern indicated. Internal parts shall be removable through the diffuser-neck for access to the duct and without the use of special tools. Construct each diffuser of four or more concentric elements designed to deliver air in a generally horizontal direction. The interior elements of square and rectangular ceiling diffusers may be square or rectangular as manufacturer's standard. Screws or bolts in exposed face of frames or core elements are not acceptable. Diffusers shall have an opposed blade volume damper in the diffuser neck. Diffusers shall have a 24"x24" lay-in panel for areas with acoustical ceilings and surface-mount frame for GWB ceilings.

E. Grilles and Registers: Construction and finish as indicated, 1/2" louver spacing, 45^{o} curved blade. Registers shall have opposed-blade volume dampers with screwdriver adjuster. Unless otherwise indicated, registers shall be provided.

F. General: The interior of all sheetmetal connections to grilles, registers and diffusers shall be painted with a non-specular flat black paint so that no sheetmetal surfaces are visible from the finished space.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the duct systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 INSTALLATION OF DUCTWORK AND AIR DEVICES

A. Provide and erect in accordance with the best practice of the trade ductwork shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place ductwork in proper position to avoid conflicts with other work and to allow the application of insulation and finish painting to the satisfaction of the Architect. Sizes given are "inside - clear" dimensions and not necessarily that of sheet metal. Ducts shall be arranged to adjust to "field conditions". The Sheet Metal trades shall coordinate his work

with other trades. Work shall conform to ASHRAE duct construction recommendations, SMACNA "Duct Construction Standards", NFPA, and the requirements of BOCA code.

B. Joint Sealing: See PRODUCTS section.

C. Longitudinal joints: See PRODUCTS section.

D. Turns shall be made with long radius elbows or, if physically impossible to use long radius elbows, shall be square turns with specified turning vanes. CAUTION: Turns not conforming to this requirement shall be ordered removed and replaced with properly built turns.

E. Access Doors: Provide access doors for concealed apparatus requiring service and inspection in the duct system including but not limited to dampers, sensors and motors, and upstream and downstream from duct coils.

F. Duct Sleeves and Prepared Openings: Install duct sleeves and prepared openings for duct mains, duct branches, and ducts passing through walls, roofs, and ceilings. Insure the proper size and location of sleeves and prepared openings. Allow one-inch clearance between duct and sleeve or one-inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.

G. Duct Supports: Unless otherwise indicated, provide one-inch wide by 16 gage galvanized steel sheet metal strips on each side of ducts. Anchor risers in the center of the vertical run to allow ends or riser free vertical movements. Attach supports only to structural framing members. Do not anchor supports to metal decking unless a means is provided (architectural review required) for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.

H. Flexible Collars and Connections: Provide flexible collars between fans and ducts or casings and where ducts are of dissimilar metals, as indicated or required. For round ducts, securely fasten flexible connections using stainless steel clinch-type draw-band. Nylon drawbands may be used if installed using the drawband manufacturer's lever-action tightening tool. For rectangular ducts, lock flexible connections to metal collars.

I. Flexible Ducts: Provide where indicated. No fiberglass shall be in contact with air flow. Flexible duct length shall not be more than 4'-0". Install with metal band hangers and without excess length, provide maximum extension of flex duct. Securely fasten flexible ducts to metal collars using a stainless steel or tool-tightened nylon drawband on the duct core and a second drawband on the insulation vapor barrier. If the duct exceeds 12 inches diameter, position the drawband behind a bead on the metal collar. Taping in lieu of drawbands is not allowed.

J. Any deviation in the duct system must be submitted as a shop drawing and stamped. CAUTION: Any deviation not submitted and favorably reviewed will be ordered removed from the system and replaced with that which is shown on the Drawings.

K. Discrepancies between actual field conditions and the Contract Documents shall be brought to the attention of the Architect prior to fabrication.

L. Field Changes to Ductwork: Field changes of ducts such as those required to suit the sizes of factory-fabricated equipment actually furnished shall be designed to minimize expansion and contraction. Use 4:1 transitions in field changes as well as modifications to connecting ducts.

M. Transitions with a slope greater than 4 to 1 shall be ordered removed from the system and replaced with a transition which meets this criteria.

N. Joints and seams at intake and exhaust plenums and joints on intake and exhaust ductwork for a distance of 3 feet from the plenum shall be sealed watertight on the bottom and side joints and seams.

O. Isolation dampers at intake and exhaust louvers and vent hoods shall be sealed to the ductwork to provide an airtight assembly with similar performance characteristics to the isolation damper.

3.3 CLOSING IN WORK

A. Cover up or enclose work after it has been properly and completely tested and reviewed.

B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.4 TEST AND ADJUST

A. Ductwork shall be leak tested in accordance with Section 15990 "Testing and Balancing Air and Water Systems". Provide end cap and closure pieces. Close off and seal openings in ductwork to be tested. Ductwork shall be tested before it is insulated.

B. Before operating any system, the system shall be cleaned out to remove dust and foreign materials.

C. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.

D. Correct defects which develop during the test period, conduct additional testing until defect free operation is achieved.

3.5 CLEANUP AND CORROSION PREVENTION

A. Ductwork and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.

B. Before covering is applied to duct systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces.

3.6 INSTRUCTIONS

A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

3.7 FIRESTOPPING

A. Firestopping shall be performed in accordance with Specification Section 07840 “Firestopping”. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

* END OF SECTION *

SECTION 15900 - AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the automatic temperature control system indicated. The system shall be electric/electronic to provide the sequences as described in these specifications. The ATC system shall be complete including required components including low voltage and line voltage wiring. Wiring shall be installed in accordance with division 16 of the specifications and the National Electric Code.

1.02 ACCEPTABLE MANUFACTURERS

A. Honeywell, Inc.
B. Siebe
C. Siemens
D. Johnson

1.03 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" and SECTION 16000 “ELECTRICAL” are hereby made a part of the work of this section.

1.04 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000 relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

B. The items for which the shop drawings paragraph in Section 15000, Supplemental General Mechanical Requirements, apply are as follows:

1. Temperature control system schematic including variables, flow diagrams, ladder diagrams, and point to point wiring diagrams, indicating set points, reset ranges, throttling ranges, controller gains, differentials, operating ranges, normal positions, controller action, dial ranges, voltages, currents, mounting locations, indicators, and terminal strip points.

2. Sequence of operation for each system and function.

3. Generic, functional description of each control component indicated.

4. Equipment interlocks required by sequence of operation.

5. Automatic valve schedule showing flow, Cv, and pressure drop.

6. Manufacturer's Data:

   a. Dampers, valves and operators.
   b. Controllers, including wiring and connection diagrams.
   c. Thermostats, temperature sensors, including wiring and connection diagrams.
   d. Temperature and pressure indicators.
   e. Pressure sensors, including wiring and connection diagrams.
   f. Switches, relays, transmitters, transformers, including wiring and connection diagrams.

PART 2 PRODUCTS

2.01 CONTROL PANELS

A. In general, relays, transformers, or other control devices (not including room thermostats or duct-mounted instruments) shall be grouped and mounted in a factory-built cabinet enclosure.

2.02 AUTOMATIC CONTROL DAMPERS

A. Automatic dampers not furnished with equipment shall be furnished under this paragraph. Automatic dampers shall be constructed and installed in accordance with the following specifications:

1. Damper Blades: All automatic dampers, including dampers for static pressure control, shall be of the balanced type, factory-fabricated, with fully gasketed galvanized steel airfoil blades, mounted in welded frames. Damper blades shall be not more than 8 inches wide, shall have interlocking edges, edge and jamb seals and be capable of operation against 4" static pressure differential. Dampers shall be Arrow "Arrow-Foil" Model PBDAF-206, OBDAF-207, Ruskin Model CD-60 or Tamco Series 1000.

2. Modulating Dampers: All modulating dampers shall be of the opposed blade type.

3. Damper Size and Bearings: Damper blades shall have steel trunnions mounted in oil-impregnated bearings. Dampers shall be not more than 48 inches in length between bearings.

4. Frames: Damper frames shall be of welded channel or angle-iron, with heavy steel corner gussets and braces or stiffened with steel tie-rods where necessary. Frames shall be painted with aluminum paint to prevent rusting.

5. Dampers shall be guaranteed to close tightly, and shall provide substantially the full area of the opening when open. All outdoor air intakes and all exhaust ducts to outside and all fresh air, return air and exhaust air dampers in systems shall have damper blades with inflatable seals or other devices to guarantee low leakage, not to exceed 6 CFM/SF at 1 in. WG pressure differential.

6. Damper Linkages: Damper-operating links shall be cadmium plated steel or brass rods, adjustable in length with ball and socket joints and of such proportions that they will withstand, without appreciable deflection, a load equal to not less than twice the maximum operating force of the damper motor. Linkages shall be concealed in the frame.

B. Damper Actuators: For each automatically controlled damper, a suitable damper actuator or actuators shall be provided in accordance with the following specifications:

1. Actuator: Damper actuators shall be electronic, direct-coupled, spring-return type and have a rating of not less than twice the torque needed for actual operation of the damper.

2. Adjustments: Provide adjustable stops for the open and closed positions.

3. Mounting: Damper actuators shall be direct-coupled over the shaft. The damper actuators and mounting base shall not be mounted directly on cold or insulated ducts and casings, but shall be mounted outside the insulated covering in such a manner as to prevent sweating and interference with the insulation.

4. Where indicated, damper actuators shall be provided with an auxiliary switch rated at 120 V AC, and accept a 4 to 20 ma input.

2.03 AUTOMATIC CONTROL VALVES (HOT WATER, 250^{O}F MAX.)

A. Valves shall have removable composition discs with monel stem. Bodies two inches or smaller shall be bronze with screwed ends. Bodies 2-1/2 inches and larger shall be cast-iron with flanged ends. Valve bodies, trim and stuffing boxes shall be designed for not less than 125 psi working pressure. Valve packing shall be non-lubricated teflon packing suitable for hot water service, as required.

B. Modulating valves shall be sized for maximum pressure drop of 1.5 to 4.0 psi.

C. Automatic control valve differential shut-off pressure shall be a minimum of 35 psig.

D. Heating valves shall fail to the "normally-closed" position with a manual override switch..

E. Valves shall have a clearly marked position indicator as part of the operating linkage.

F. Actuator: Shall be electronic, direct-coupled, spring-return type and have a rating of not less than twice the torque needed for actual operation of the valve.

2.04 THERMOSTATS

A. Honeywell T87F1859 or equal room thermostats shall have a range of 40^{o} to 90^{o}F adjustable sensitivity with a minimum sensitivity of not less than one degree plus or minus, and shall have bi-metal or vapor- pressure-sensitive elements. Thermostats shall be securely attached to a suitable base mounted on the wall or other building surface. Each thermostat shall be located where shown or, if not shown, where it will respond to the average temperature in the room.

Thermostats, generally, shall be mounted 54 inches above the floor, and shall not be mounted on outside walls, over light dimmers, or partitions between rooms if other locations are possible. If located on outside wall, it shall have an insulated base. Thermostats, where indicated, shall have locked or concealed adjustment devices, by means of which the operating points can be adjusted through a range of not more than 10 degrees above and below the operating points specified. Room thermostats shall be provided with thermometers.

2.05 SEQUENCE OF CONTROL

A. Provide and install electronic/electric components (NOT PNEUMATIC) to enable the mechanical system to operate in the following sequences:

1. Hot Water Reset: Reset the supply water temperature via boiler reset from outside air temperature. The minimum temperature to be 120 Deg. F. at 60 Deg. F. outside air temperature (adjustable). The maximum shall be 200 deg F at 0 deg F outside air temperature. On a call for domestic hot water, 3-way valve (V-1) shall assume HWS/R reset control and the boiler reset shall be overridden to provide 200°F water to the water heater.

2. Main Heating Hot Water Circulators (CP-1 & CP-2): Operate Lead/Lag - if lead circulator fails the Lag circulator shall run. The lead-lag pumps shall be alternated based on runtime. At outside air temperatures above 60oF, CP-1 and CP-2 shall be de-energized. At outside air temperatures below 60oF, CP-1 and CP-2 shall operate continuously.

3. Secondary Heating Hot Water Circulators (CP-6 & CP-7): Shall operate in a "Lead-Lag" sequence. Both pumps shall be interlocked with a flow switch in the main heating circuit. If flow is proven, on a call for heat from the reset controller the "lead" pump shall start and the respective burner shall operate on "low fire". On a further call for heat the burner shall go to "high fire". The "lag" pump and respective burner shall sequence on in the same manner until the hot water supply setpoint is satisfied. A time delay shall keep the pumps operating for approximately one (1) minute after the respective burner stops firing. The "lead" and "lag" pumps shall be alternated based on runtime. A time delay shall prevent the "lag" boiler from firing for 5 minutes after the "lead" boiler fires on high fire. If, after 5 minutes of the"lead" boiler running on high fire, additional heat is required the "lag" boiler shall sequence to fire.

4. Domestic Hot Water Pump (CP-3): shall be cycled from immersion temperature sensors located in the domestic hot water supply leaving the domestic water heating tanks.

5. Fintube Radiation (V-2): The zone valve shall cycle as required to satisfy the zone temperature setpoint.

6. Hot Water Recirculation Pump (CP-5): Pump shall operate continuously.

7. Supply Fans:

a. SF-1 shall operate based on a wall mounted thermostat, see drawings. Combustion air dampers shall be open when the supply fan is energized.

b. SF-2 and SF-3 shall operate continuously.

8. Exhaust Fans:

a. EF-1, EF-2, EF-3, EF-4, EF-5, EF-6 shall be operated by a switch mounted on the wall.

b. EF-7 and EF-8 shall operate continuously.

c. EF-9 shall operate based on a wall mounted thermostat to maintain a room temperature of 80°F. At space temperatures below 80°F the fan shall be de-energized. The motor operated dampers on the elevator machine room supply and exhaust shall open prior to starting the fan and shall be closed when the fan is de-energized.

9. Unit Heaters/Cabinet Unit Heaters/Wall Heaters: On a call for heating by the room thermostat, the fan shall operate subject to the pipe mounted aquastat to satisfy the heating setpoint (68EF, adjustable).

10. Unit Ventilators:

a. Occupied Mode:

1) Supply Fan: The supply fan shall run continuously.

2) Warm-up: The outside air damper shall be closed and the unit shall operate on 100% return air until the occupied room temperature setpoint is reached. Upon reaching setpoint the outside air damper shall go to the 50% minimum open position.

3) Economizer Cooling: On a call for cooling from the space sensor, the outside air damper shall proportion toward the 100% open position.

4) Heating: On a call for heating from the room temperature sensor the outside air damper shall go to the minimum position and the face-and-bypass dampers shall control the unit heating capacity.

5) Cooling: On a call for cooling when outside air is not suitable for economizer cooling, condensing unit CU-1 shall cycle to maintain the room cooling setpoint.

6) Ventilation: During “occupied” periods, the outside air damper shall be open to the minimum position.

7) Freeze Protection: A manual reset freezestat shall shut down the fan and close the outside air damper and move the face-and-bypass dampers to full coil heat if the discharge supply temperature falls below 45oF (adjustable).

8) Low Limit Discharge Control: A temperature sensor in the unit discharge shall prevent air colder than 55BF. from being delivered to the space.

b. Unoccupied Mode:

1) Outside air damper shall close, return air damper shall open, the supply fan shall cycle to maintain the unoccupied heating setpoint (60°F adjustable).

c. Occupied/unoccupied mode shall be determined by the DDC system timeclock.

11. Energy Recovery Ventilator:

a. The supply and exhaust fans shall operate continuously.

b. The energy recovery wheel shall operate continuously.

c. Heating:

1) Valve V-3 shall modulate to maintain a supply air temperature of 70°F.

2) At outside air temperatures above 65°F, circulating pump CP-4 shall be de-energized.

d. Freeze protection: A manual reset freezestat shall shutdown the fans and close the outside air and exhaust air dampers. Valve V-3 shall be positioned to prevent return water from re-entering the coil.

e. Wheel Rotation Sensor: A wheel rotation sensor shall shutdown the fans and close the outside air and exhaust dampers if the wheel stops rotating.

f. Motorized Dampers: Outside air and exhaust air dampers shall close upon unit shutdown.

12. Combustion Air Dampers:

a. MOD-1, MOD-2 and MOD-3 shall be normally closed, SF-1 de-energized.

b. Prior to firing either burner, MOD-1 and MOD-2 shall open.

c. At space temperatures above 85°F (adjustable), MOD-1 and MOD-3 shall open, MOD-2 shall close and SF-1 shall start.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that the automatic temperature control and system may be installed in strict accordance with pertinent codes and regulations and the reviewed Shop Drawings.

3.02 INSTALLATION

A. Provide wiring, and conduit to connect the ATC components for an operational ATC system. Wiring and installation shall conform to NFPA 70.

B. Identification: Label or code each field wire at each end. Permanently label or code each point of field terminal strips to show the instrument or item served. Color-coded cable with annotated cable diagrams may be used to accomplish cable identification.

C. Temperature Sensors: Stabilize sensors to permit on-the-job installation that will require minimum field adjustment or calibration. Temperature sensor assemblies shall be readily accessible and adaptable to each type of application to allow quick, easy replacement and servicing without special tools or skills. Strap-on sensor mountings, using helical screw stainless steel clamps, shall be permitted on new piping for unit heater or other on-off operation only, after pipe is cleaned to bright metal. Strap-on bulb and pipe shall be insulated after installation. Strap-on sensor mountings are also permitted for hot water piping sizes up to 2 inches. Other liquid temperature sensors shall be provided with wells.

D. Duct Sensors: Provide sensors in ductwork; specific location within duct shall be selected to accurately sense air properties. Do not locate sensors in dead air spaces or positions obstructed by ducts or equipment. Installation shall be within the vibration and velocity limits of the sensing element. Where an extended surface element is required to sense the average or lowest air temperature, position and securely mount sensor within duct in accordance with sensor manufacturer's recommendations. Temperature sensing elements shall be thermally isolated from brackets and supports. Provide separate duct flange for each sensing element; securely seal ducts where elements or connections penetrate duct. Seal penetrations of duct insulation vapor barrier with vapor barrier coating compound to provide a vapor-tight covering. Mount sensor enclosures to allow easy removal and servicing without disturbance or removal of duct insulation or vapor barrier. On downstream side of each sensor, provide access doors.

E. Pipe Sensors: Provide wells for sensors measuring temperatures in pressure vessels or in pipes. Wells shall be noncorrosive to the medium being measured and shall have sufficient physical strength to withstand the working and test pressures and velocities. Locate wells to sense continuous flow conditions. Do not install wells using extension couplings. Where piping

diameters are smaller than the length of the wells, provide wells in the piping at elbows to effect proper flow across the entire area of the well. Wells may either look upstream or downstream. Provide thermal transmission material within the well to speed the response of temperature measurement. Provide wells with sealing nuts to contain the thermal transmission material and allow for easy removal. Wells shall not restrict flow area to less than 70 percent of line-size-pipe normal flow area. Increase piping size as required to avoid restriction.

3.03 ADJUSTMENTS

A. Adjust controls and equipment to maintain the conditions indicated, to perform the functions indicated, and to operate in the sequence specified.

3.04 INSTRUCTING OPERATING PERSONNEL

A. Upon completion of the work and when designated by the Architect, furnish the services of a competent technician regularly employed by the temperature control manufacturer for the instruction of Owner in the operation and maintenance of each automatic space temperature control system. The period of instruction shall be for not less than two 8-hour working days and shall include video tape demonstration of controllers.

3.05 FIELD INSPECTION AND TESTS

A. Tests shall be performed or supervised by employees of the ATC system or manufacturer of the ATC system, or by an authorized representative of the ATC manufacturer. Give Architect 14 calendar days advance written notice prior to the date of the field acceptance testing. If the Architect witnesses tests, such tests shall be subject to approval. If the Architect does not witness tests, provide performance certification.

B. Plan for Inspections and Tests: Furnish a written inspections and tests plan at least 60 days prior to the field acceptance test date. This plan shall be developed by the manufacturer of the ATC system. The plan shall delineate the inspections and testing procedures required for the ATC system to demonstrate compliance with the requirements specified. Additionally, the test plan shall indicate how ATC system is to be tested, what variables will be monitored during test, names of individuals performing tests, and what criteria for acceptance should be used. Indicate how operation of H&V system and ATC system in each seasonal condition will be simulated.

C. Field Acceptance Testing: Upon completion of 72 hours of continuous H&V and ATC systems operation and before final acceptance of work, test the automatic temperature control systems in service with the heating, ventilating and air conditioning systems to demonstrate compliance with contract requirements. Test controls through each cycle of operation, including simulation of each season insofar as possible. Test safety controls to demonstrate performance of required function. Adjust or repair defective or malfunctioning automatic space temperature control equipment or replace with new equipment. Repeat tests to demonstrate compliance with contract requirements.

* END OF SECTION *

SECTION 15990 - TESTING AND BALANCING AIR AND WATER SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work covered by this section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required for testing and balancing the air and water systems.

B. Alternates: Refer to SECTION 01010 - SUMMARY OF WORK, to determine what extent, work of this section will be affected by any accepted alternates.

1.02 GENERAL REQUIREMENTS

A. The provisions of Section 15000, "Supplemental Mechanical Requirements", apply to this section.

1.03 DEFINITIONS

A. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment, (e.g., reduce fan speed, throttling).

B. Balance: To proportion flows within the distribution system (submains, branches and terminals) in accordance with specified design quantities.

C. Procedure: Standardize approach and execution of sequence of work operations to yield reproducible results.

D. Report Forms: Test data sheets arranged for collection of test data in logical order to submission and review. This data should also form the permanent record which shall be used as the basis for any future testing, adjusting, and balancing required.

E. Test: To determine quantitative performance of equipment.

1.04 SUBMITTALS: Submit the following:

A. Standards Compliance:

Testing Agency
Testing Agency Personnel
Professional Engineers
Instrument Calibration

1.05 TESTING AND BALANCING AGENCY

A. Air and Water Systems Testing and Balancing: Upon completion of the installation and field testing, performance test and adjust the supply, return, make-up, and exhaust air systems, and heating water systems to provide the air volume and water flow quantities indicated. Accomplish work in accordance with the agenda and procedures specified and AABC 71679 and standards of the NEBB. Correct air and water system performance deficiencies disclosed by the test before balancing the systems.

B. Agency Qualifications: Obtain the services of a qualified testing organization to perform the testing and balancing work as herein specified. Prior to commencing work under this section of the specifications, the testing organization shall have been reviewed by the Architect. The criteria for determining qualifications shall be membership in the AABC, or certification by the NEBB, or the testing organization shall have submitted proof to satisfy the Architect that the organization meets or exceeds the technical standards for membership of the AABC as published in the AABC 71679. The testing organization shall be independent of both the installing contractors and equipment suppliers for this project.

1.06 AGENDA

A. Preliminary Report: Review drawings and specifications prior to installation of any of the affected system. Submit a written report to the Architect indicating any deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the systems.

1.07 PROCEDURES, GENERAL

A. Requirements: Adjust systems and components thereof that perform as required by drawings and specifications.

B. Test Duration: Operating tests of heating and cooling coils, fans and other equipment shall be of not less than 4 hours duration, after stabilized operating conditions have been established. Capacities shall be based on temperatures and air and water quantities measured during such tests.

C. Instrumentation: Method of application of instrumentation shall be in accordance with the manufacturer's instructions. Furnish personnel, instruments, and equipment for tests specified herein.

D. Accuracy of Instruments: Instruments used for measurements shall be accurate. Provide calibration histories for each instrument for examination. Calibrate each test instrument by an reviewed laboratory or by the manufacturer. The Architect has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.

E. Accuracy of Thermometers: Plus or minus one graduation at the temperatures to be measured. Graduations shall conform with the following schedule:

Medium	Design Temperature Differential (°F)	Maximum Graduation (°F)
Air	10 or less	1/2
Air	over 10	1
Water	10 or less	1/10
Water	10-20	1/2
Water	over 20	1

F. Flow Rate Tolerance: Values are based on discussion in ASHRAE "HVAC Applications", Chapter 34. Air filter resistance during tests, artificially imposed if necessary, shall be 80 percent of final values.

1. Air Handling Unit CFM: Minus 0 percent to plus 10 percent.

2. Other Fans: Minus 0 percent to plus 10 percent.

3. Air Terminal Units (VAV Boxes): Minus 5 percent to plus 10 percent.

4. Minimum Outside Air (for manually set dampers): Minus 0 percent to plus 10 percent.

5. Individual Room Air Outlets and Inlets, and Air Flow Rates Not mentioned Above: Minus 10 percent to plus 10 percent.

6. Heating System Pumps GPM: Minus 0 percent to plus 10 percent.

7. Other Pumps GPM: Minus 10 percent to plus 10 percent.

8. Air Handling Unit Coils GPM: Minus 5 percent to plus 10 percent.

9. Terminal Unit Coils/Elements GPM: Minus 10 percent to plus 10 percent.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 AIR SYSTEM PROCEDURES

A. Adjustments: Adjust air handling systems to provide the required design air quantity to, or through, each component. Conduct adjusting and balancing of systems during periods of the year approximating maximum seasonal operation.

B. Balance: Use flow adjusting (volume control) devices to balance air quantities only; i.e., proportion flow between various terminals comprising system, and only to the extent that their adjustments do not create objectionable air motion or sound, i.e., in excess of specified limits.

C. Balancing Between Runs (submains, branch mains, and branches): Use flow regulating devices at, or in, the divided - flow fitting. Minimize restriction imposed by flow regulating devices in or at terminals.

D. Final Measurements of Air Quantity: Make final measurements of air quantity, after the air terminal has been adjusted to provide the optimum air patterns of diffusion.

E. Fan Adjustment: Total air system quantities, generally, shall be varied by adjustment of fan speeds, or axial-flow fan wheel blade pitch. For systems with direct-connected fans (without adjustable pitch blades), damper restrictions of a system's total flow or variable speed rheostats shall be adjusted as appropriate.

F. Air Measurement:

1. Pitot Tube: Except as specifically indicated herein, make pitot tube traverses of each duct to measure air flow therein. Pitot tubes, associated instruments, traverses, and techniques shall conform with the ASHRAE Handbook Fundamentals.

2. Pitot Tube Traverse: Pitot-tube traverse may be omitted if the duct serves only a single room or space and its design volume is less than 2000 cfm. In lieu of Pitot-tube traverse, determine air flow in the duct by totalling volume of individual terminals served, measured as described herein.

3. Measurements of Air Quantity: Where duct's design velocity and air quantity are both less than 1000 (fpm/cfm), air quantity may be determined by measurements at terminals served.

G. Air Terminal Balancing: Measurement of flow rates by means of velocity meters applied to individual terminals, with or without cones or other adapters, shall be used only for balancing.

3.02 WATER SYSTEM PROCEDURES

A. Adjustment: Adjust heating, water systems to provide required quantity to, or through each component.

B. Metering: Measure water quantities and pressures with calibrated meters.

C. Water Measurements and Balancing: Use venturi tubes, orifices, or other metering fittings and pressure gages. Adjust systems to provide the design flow rates through the heat transfer equipment prior to the capacity testing. Perform measurement of temperature differential with the air system, adjusted as described herein, in operation.

D. Automatic Controls: Position automatic control valves for full flow through the heat transfer equipment of the system during tests.

E. Flow: Flow through by-pass circuits at three-way valves shall be adjusted to balance that through the supply circuit.

F. Distribution: Adjust distribution by means of balancing devices (cocks, valves, and fittings) and automatic flow control valves. Do not use service valves for adjustment. Where automatic flow control valves are utilized in lieu of venturi tubes, record only the pressure drop across the valve if within the pressure drop rating on the valve tag.

G. Special Procedures: Where available, pump capacity (as designed) is less than total flow requirements of individual heat transfer units of system served, full flow may be simulated by the temporary restriction of flow to portions of the system.

3.03 SOUND TEST PROCEDURES

A. Sound Compliances Tests: Tests to demonstrate compliance with sound requirements shall be made as indicated.

B. Timing: Take sound level measurements at times when the building is unoccupied, or when activity in surrounding areas and background noise levels in areas tested are at minimum and free from sudden changes in noise levels. Take measurements with equipment secured, except that being tested. Measure sound levels at any point within a room not less than 6 feet from an air terminal or room unit, and not closer than 3 feet from any floor, wall, or ceiling surface.

C. Meters: Measure sound levels with a sound meter complying with the latest ANSI S1.4. Use the "A" scale to measure overall sound levels. To determine the specified octave band levels, the above sound level meter shall be supplemented by an Octave Band Analyzer complying with ANSI S1.11.

D. Equipment Components: Determine "equipment components" of room sound (noise) levels for each (of eight) octave bands as follows:

1. Measure room sound pressure level "LPb" with equipment to be tested shut off.

2. Measure room sound pressure level "LPt" with equipment to be tested turned on.

3. Calculate LPt-LPb; if this value is less than one, applicable test must be rerun with lower background level (LPb) unless LPt is within sound pressure level specified for equipment.

4. Determine "C" from table below:

LPt-LPb (dB) 1 2 3 4-4-1/2 5-5-1/2 6-7-1/2 8-12 over 12

C (dB) 7 4 3 2 1-1/2 1 1/2 O

5. The "equipment component" of room sound level equals LPt-C.

3.04 CERTIFIED REPORTS

A. Submittal: Submit three copies of the reports described herein, covering air and water system performance, air motion (fpm), to the Architect prior to final tests and inspection.

B. Instrument Records: Include types, serial numbers, and dates calibration of instruments.

C. Reports: Reports shall identify conspicuously items not conforming to contract requirements, or obvious maloperation and deficiencies.

D. Certification: The reports shall be certified by an independent Registered Professional Engineer who is versed in the field of air and water balancing and who is not affiliated with any firm involved in the design or construction phases of the project.

3.05 AIR SYSTEM DATA

A. Report: The certified report shall include for each air-handling system the data listed below:

1. Equipment (fan or factory fabricated station unit):

a. Installation Data:

1) Manufacturer and Model
2) Size
3) Arrangement, Discharge, and Class
4) Motor H.P., Voltage, Phase, Cycles, and Full Load Amps.
5) Location and Local Identification Data

b. Design Data: Data listed in schedules on drawings and specifications.

c. Fan Recorded (Test) Data

1) C.F.M.
2) Static Pressure
3) R.P.M.
4) Motor Operating Amps.
5) Motor Operating B.H.P.

2. Duct Systems:

a. Duct Air Quantities (Maximum and Minimum) - Main, Submains, Branches, Outdoor (Outside) Air, Total-Air, and Exhaust

1) Duct size(s)
2) Number of Pitot-tube (Pressure) Measurements
3) Sum of Velocity Measurement, excluding pressure measurements
4) Average Velocity
5) Recorded (Test) C.F.M.
6) Design C.F.M.

b. Individual Air Terminals:

1) Terminal Identification (Supply or Exhaust, Location and Number Designation)
2) Type Size, Manufacturer, and Catalog Identification
3) Design and Recorded Quantities - C.F.M.
4) Deflector Vane or Diffusion Cone Settings
5) Applicable Factor for Application, Velocity, Area
6) Design and Recorded Velocities - F.P.M. (State "core" "inlet," as applicable)

3.06 WATER SYSTEM DATA

A. Report: Include data listed below:

1. Pumps:

a. Installation Data:

1) Manufacturer and Model
2) Size
3) Type Drive
4) Motor H.P., Voltage, Phase, and Full Load Amps.

b. Design Data:

1) G.P.M.
2) Head
3) R.P.M.
4) B.H.P. and Amps.

c. Recorded Data:

1) Discharge Pressures (Full-Flow and No-Flow)
2) Suction Pressures (Full-Flow and No-Flow)
3) Operating Head
4) Operating G.P.M. (from pump curves if metering is not provided)
5) No-Load Amps. (where possible)
6) Full-Flow Amps

7) No-Flow Amps

2. Air Heating and Cooling Equipment:

a. Design Data:

1) Load in Btu per hr
2) G.P.M.
3) Entering and Leaving Water Temperature
4) Entering and Leaving Air Conditions (D.B. and W.B.)
5) C.F.M.
6) Water Pressure Drop

b. Recorded Data:

1) Type of Equipment and Identification (location or number designation)
2) Entering and Leaving Air Conditions (D.B. and W.B.)
3) Entering and Leaving Water Temperatures
4) G.P.M. (if metered)
5) Temperature Rise or Drop

3.07 SOUND LEVEL DATA

A. Sound level tests shall be performed in the gymnasium and auditorium.

B. Report: The certified report shall record data on sound levels, taken at each selected location, as follows:

1. Source of sound and location

2. Diagram or description of relationship of sound source to measuring instrument.

3. "A" scale readings:

a. Equipment being tested turned off (ambient) (2) Equipment being tested turned on (operating conditions)

4. Reading at each specified octave band frequency:

a. Equipment being tested turned off (ambient) (2) Equipment being tested turned on (operating condition)

5. "Equipment components" of sound (noise) levels with applicable calculations per "Sound Test Procedure."

6. Graph showing relationship between pressure levels specified and recorded readings.

C. Retest: Subsequent to any correctional construction work, such as acoustic corrections, make measurements to verify that associated air and water quantities, as previously measured, have not been disrupted.

D. Certified Report: Record sound data, and their locations, after final adjustments of air and water systems involved.

3.08 FINAL TESTS, REVIEW, AND ACCEPTANCE

A. Capacity and Performance Tests: Make tests to demonstrate that capacities and general performance of air and water systems comply with contract requirements.

B. Final Inspection: At the time of final review, recheck, in the presence of the Engineer, random selections of data water and air quantities and air motion recorded in the certified report.

C. Points and Areas for Recheck: As selected by the Architect.

D. Measurement and Test Procedures: As reviewed for work forming basis of certified report.

E. Selections for Recheck (specific plus random): In general, selections for recheck will not exceed 25 percent of the total number tabulated in the report.

F. Retests: If random tests elicit a measured flow deviation of ten percent or more from, or a sound level of 2 Db or more greater than that recorded in the certified report listings, at ten percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made.

G. Marking of Settings: Following final acceptance of certified reports by the Architect, the settings of valves, dampers, and other adjustment devices shall be permanently marked, so that adjustment can be restored if disturbed at any time. Do not mark devices until after final review.

*** END OF SECTION ***

Part II
Division 16

Electrical

SECTION 16000 - ELECTRICAL

PART 1 GENERAL

1.01 SCOPE

A. The work covered by this section includes the furnishing of labor and materials, equipment, and incidentals and the performing of operations in connection with "electrical work" as indicated on the drawings and/or specified herein and including incidental items to effect a finished, complete and operable system as indicated. The electrical work shall include but not be limited to:

1. New underground services for power, cable TV, and telephone including pull wire in tel/CATV conduits.
2. Secondary power distribution system including meter stack.
3. Lighting system - interior and exterior.
4. Fire alarm systems.
5. Connections, disconnects and starters as shown for mechanical equipment.
6. Telephone jacks, cables and backboard.
7. Cable TV entrance box, wiring and jacks.
8. Apartment intercom/door release systems.
9. Automatic door wiring.

Work shall be subject to the conditions of the contract and shall be in strict accordance with these plans and specifications.

B. Before submitting his bid, the Electrical Contractor is required to visit the site and survey the conditions likely to be encountered in the performance of the electrical work. Failure to familiarize himself with said conditions shall not relieve the Contractor of responsibility for full completion of the work in accordance with the provisions of the Contract.

C. The term "Contractor used hereinafter shall designate the Electrical Contractor.

D. Any questions regarding this specification or the Electrical Drawings must be addressed in writing to the Architect before bids close; after close of bids, the Architect's interpretation of the meaning and intent of the specifications and drawings shall be made according to the provisions of the General Conditions.

1.02 RELATED DOCUMENTS

A. The General Conditions, Supplemental General Conditions and Instructions to Bidders shall apply to this work.

1.03 CODES AND STANDARDS

A. Where referred to, published standard specifications of technical societies, trade associations and governmental agencies codes and regulations of Underwriters and protective organizations, Federal, State and Municipal regulations and codes and publications of a similar nature shall be the edition current as of the date of this Specification.

B. The applicable requirements of the publications of the following organizations shall apply to the work under this section as if fully written herein:

1. American National Standards Institute, Inc. (ANSI)
2. National Electrical Manufacturers Associations (NEMA)
3. National Fire Codes (NFPA)
4. Underwriters Laboratories, Inc. (UL)
5. Federal, State and Municipal Building Codes, and all other Authorities having jurisdiction.
6. National Electrical Code (NEC)
7. Americans with Disabilities Act (ADA)
8. Occupational Safety and Health Administration (OSHA)

1.04 MATERIALS AND EQUIPMENT

A. Materials shall be of the best quality. Workmanship shall be of highest grade and construction shall be done according to best practices of the trade.

B. Provide, when required, labeled samples of material or equipment specified herein or proposed to be used in this work.

C. Where words "furnish", "provide", or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install", including materials complete with connections, supplemental devices, accessories and appurtenances, unless specifically noted otherwise. These words are likewise hereby interpreted as being prefixed to materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or scheduled information or in the technical sections of the specifications.

1.05 SHOP DRAWINGS

A. Submit to the Architect for approval not less than eight (8) sets of Shop Drawings of the materials, fixtures and equipment to be incorporated in the work. Information shall contain specific reference to catalog numbers and shall be qualified in writing as required. No considerations will be given to brochure or catalog information not specifically designated or referenced to the specification by an identifying number.

B. Shop drawings that are facsimiled, (FAX) produced, or photocopies of FAX documents will not be considered or reviewed. Only originals and or photocopied originals, complying with paragraph A above will be considered.

C. Before consideration, electrical submittal packages shall include cover pages for each of the electrical equipment groups, i.e. loadcenters, lighting, fire alarm, devices, emergency call system, apartment intercom/security system.

D. Shop drawings must bear the Architect's review stamp. In the event that the Architect rejects shop drawings, the shop drawing must be revised and resubmitted for review.

1.06 SUBSTITUTIONS

A. Reference in the specifications or on the drawings to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Architect is first obtained.

1.07 CODES, PERMITS, INSPECTIONS

A. The installation shall comply with laws and regulations applying to the electrical installation in effect at the site with regulations of any other governmental body of agency having jurisdiction, and with regulations of the National Electrical Code (NEC).

B. Obtain and pay for permits required by the ordinances at the site. After completion of the work, furnish the Owner a certificate of final inspection and approval from the Inspection Bureau having jurisdiction.

C. Inspections and tests shall be made in accordance with the requirements of Division One. Rejected materials shall be removed from the site and new materials furnished, retested and installed to the satisfaction of the Architect without additional cost to the Owner.

D. Arrange for periodic inspections by the local Electrical Inspector during construction.

1.08 TEMPORARY LIGHT AND POWER

A. Temporary light and power shall be installed and maintained by the Electrical Contractor for use by all trades for the duration of construction complete with all wiring, switches, protective devices and similar equipment as may be required. Arrangement for the temporary service with the Power Company is the responsibility of the Electrical Contractor. Power bills will be paid by the General Contractor.

1.09 ACCEPTANCE

A. Before acceptance of the work under this section, damaged or imperfect materials shall be refinished or replaced, debris, scaffolding and tools shall be removed and premises shall be "broom clean" to the satisfaction of the Owner.

1.10 GUARANTEE

A. This contractor shall guarantee materials and installations under normal use to be free of defects and poor workmanship for a period of one (1) year from the date of acceptance. Any replacement of parts or adjustments, including labor made necessary by inherent defects, shall be provided by the contractor without cost to the Owner within the guarantee period.

1.11 PROTECTION OF EQUIPMENT AND MATERIALS

A. Protect equipment and material for the electrical work after delivery, before and after installation. This protection must be extended against pilferage, dampness and damages from all causes until the work is accepted by the owner.

1.12 ELECTRICAL REFERENCE SYMBOLS

A. Symbols shown on the Drawings show approximate locations of fixtures, outlet boxes, conduit runs and other equipment, unless otherwise detailed. The exact location shall be governed by structural conditions and obstructions. This is not to be construed as to permit redesigning systems. Outlets shall be connected from circuits as shown on the drawings. Locate and install boxes and equipment where they will be readily accessible.

1.13 MATERIALS AND INSTALLATION

A. Only the best materials of each class specified shall be used and the installation shall be made in a neat and workmanlike manner, complete in every detail, ready for immediate satisfactory operation by the Owner.

1.14 WORK BY OTHERS

A. Trenching and backfill

B. Painting

C. Cutting and patching

D. Telephone and cable TV service entrance cable and interface.

E. Concrete bases for lighting standards and bollards.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Unless otherwise indicated, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design that complies with the specification requirements.

B. Materials shall be delivered to the site in the original sealed containers of packages bearing the manufacturer's name and brand designated. Materials shall be stored in a clean, well-ventilated, warm area. Care shall be exercised in handling materials during delivery, storage and installation. Materials damaged, in the opinion of the Architect, shall be replaced at no additional cost to the Owner.

2.02 EQUIPMENT MOUNTING AND SUPPORTS

A. Provide supports including supplementary steel, channels, rods and guys required for the proper installation, mounting and support of equipment.

B. Supports shall be firmly attached and connected to building structural elements and constructed in an acceptable manner. Continuously threaded rods less than 3/8" in diameter, tie wire, or metal straps are not acceptable.

C. Supports in structural systems shall be installed as an integral part of the structural system. Explosive or cartridge driven type anchors, insert or supports are not acceptable.

D. Except as otherwise required by the Contract Documents the type and size of supports shall be as determined by the Contractor and shall be of sufficient strength and size to allow only a minimum deflection as required by codes or standards and the support manufacturer's requirements for loading.

E. Inform all parties as to location, size details and method of attachment of supports and the weight which the support is to carry, so that the installation may be coordinated.

F. Supports shall be installed in a neat and workmanlike manner, perpendicular or parallel to walls, floor, columns, beams or ceilings.

2.03 GROUNDING

A. Furnish and install grounding system as required by codes or standards.

B. Grounding terminal on receptacles and switches shall be bonded to outlet box with grounding conductor to establish grounding continuity.

C. Flexible metal conduit and electric metallic tubing feeder raceways shall include grounding conductor.

D. Grounding conductors shall be stranded copper wire with green color insulation. Grounding conductors shall be run with all circuits, feeders, etc. Raceways only will not be considered as a grounding means.

E. Grounding bushings shall be provided for raceways where required.

2.04 PANELBOARDS

A. Panelboard cabinets shall be of the dead-front safety type, provided with the size and number of single or double pole branches as indicated in the schedule. Cabinets shall be constructed of zinc coated sheet steel and shall conform to Underwriters Laboratories, Inc, Standard for Cabinet and Boxes. Cabinet heights shall not exceed 72" and shall be mounted so that the distance from the floor to center of the top circuit breaker will not exceed 6'. Cabinets shall be provided with trims having adjustable trim clamps. Trims, unless otherwise

noted, shall be fitted with hinged doors having combination lock and latch with locks keyed alike. A typewritten directory, properly identifying the circuits, shall be mounted in each frame. Panels shall be as scheduled on the Drawings.

B. Panelboards shall be surface or flush mounted with branch circuit breakers and main breaker or main lugs as indicated on the Drawings and/or specified herein.

C. Branch circuit breakers installed in the panels shall have a minimum short circuit rating as indicated on the drawings.

2.05 RACEWAYS

A. Install wiring in electric metallic tubing (EMT), and or schedule 40 PVC. Schedule 40 PVC may be used outside only, raceways within the building shall be metal.

B. Raceways and wiring, except as otherwise noted, shall be installed exposed in unfinished areas such as electrical and mechanical rooms.

C. Electric metallic tubing shall not be installed in concrete on grade, in concrete in contact with earth or underground.

D. Buried steel conduits shall have two coats of bituminous protection.

2.06 CONDUCTORS - WIRE AND CABLE

A. Branch circuit conductors installed in the building may be type "NM" cable. Panel feeders may be type SE cable if permitted by local codes.

B. Conductors shown on the Drawings shall be copper.

C. Joints and splices shall be made in a manner equivalent electrically and mechanically to the conductor itself.

D. Conductors shall be color coded - Phase A: black, Phase B: red, phase C: blue, Neutral: white, Ground: green.

E. Colors, except colors for conductors No. 4 and larger, shall be factory applied the entire length of the conductors by solid color compound, solid color coating or colored striping or bands, 2 sets 180 degree apart. On-site coloring shall not be done, except color coding by means of paint or tapes is acceptable only for conductors No. 4 and larger.

F. Voltage rating, manufacturers, type and conductor, AWG size indication shall be continuous, factory applied the entire length for each conductor.

G. Wire No. 8 AWG and larger shall be stranded. Wires smaller than No. 8 AWG shall be solid.

2.07 WIRING DEVICES

A. Switches, receptacles and other utilization devices shall be specification grade, grounding type.

B. Receptacles and switches shall have a grounding pole and grounding terminal, which shall be connected to the outlet box with grounding conductor to establish grounding continuity.

C. Verify mounting height of devices prior to roughing.

2.08 WIRING DEVICE PLATES

A. Provide device plates for devices, switches, receptacles, and miscellaneous outlets.

B. Plates shall be plastic to match the installed device.

2.09 PULL BOXES AND JUNCTION BOXES

A. Pull boxes and junction boxes shall be of code gauge galvanized steel with screw covers to match, shall be as required and shall be as shown on Contract Drawings.

B. Conductors passing through pull boxes shall be identified to indicate their origin and termination.

2.10 NAMEPLATES

A. Provide nameplates for panelboards, motor disconnect switches, and motor starters designating equipment controlled and function.

B. Nameplates shall be laminated plastic with engraved white letters. Letters shall be 1/4 inches high. Nameplates shall have identifying color background for each system.

2.11 OUTLETS

A. Outlets shall be centered in panels and spaces provided therefore. If any discrepancy is found to exist between outlets as shown on Electrical Drawings and Architectural Drawings notify Architect to have location verified prior to installation.

B. Verify power wiring with equipment wiring diagrams before wiring equipment. Disconnects and starters shall have nameplates indicating the loads they control.

2.12 LIGHTING FIXTURES AND LAMPS

A. Fixtures shall be the manufacturers specified or as otherwise determined by the Architect.

B. Energy Saving Ballasts for fluorescent fixtures shall be Class P: high power factor; shall incorporate UL listed automatic resetting protection: shall be classified for quiet operation, "A" sound rating: shall be designed for a nominal 120 volt system as shown.

C. Energy saving lamps of wattage, type and color indicated shall be furnished and installed in necessary quantity to completely lamp every fixture. Incandescent lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced on or just after the date of substantial completion.

D. Fixtures shall be complete with all accessories such as close nipples, extension couplings, connecting straps, screws, locknuts, hickies, plaster rings, to provide complete fixture installation for use with any type of standard outlet or switch box. Special fittings required to support fixtures shall be supplied as well as wood, or metal supports or grounds to support surface or pendant mounted fixtures.

2.15 FIRE ALARM SYSTEM

A. The fire alarm system shall consist of pull stations, horns and strobes, strobes only (ADA), smoke detectors, heat detectors. Furnish and install wire, cables, conduit and conduit fittings, wiring and wiring devices, junction boxes and outlet boxes, fire alarm boxes, fire detectors and control equipment and accessories indicated or specified herein for a complete fire detection installation. System shall be Notifier or equal.

B. The system shall be fully addressable, fully supervised fire alarm installed according to the drawings and specifications and in accordance with NFPA Codes 72A through 74 inclusive and local codes and the Portland Fire Department. Material shall be new, except as noted, first quality and the best of each class specified. Work shall be executed in a workmanlike manner and shall present a neat appearance when completed. Equipment shall be installed in accordance with the recommendations of the manufacturer and best standard practice for this type of work.

C. Require the manufacturer of the equipment to include the battery calculations for standby batteries. The furnishing of complete installation Drawings and Riser Diagram and connection diagrams and catalog cuts of components shall also be required of the manufacturer by this contractor.

D. Provide the services of the manufacturer of the equipment to supervise the installation, to adjust and test the system, to assure a complete and fully operative facility in accordance with the Specifications and to instruct designated personnel in the operation, adjustment, testing and maintenance of the system.

E. Notify the Architect, Owner and Portland Fire Department when the system is ready for final approval tests. The system shall be considered ready for such testing only after all necessary preliminary tests have been made and all deficiencies found have been corrected to the satisfaction of the equipment manufacturer's technical representative. Two copies of the test report shall be submitted to the Owner.

F. Furnish and install a complete 24VDV closed circuit, electrically supervised, zone annunciated fire alarm system as specified herein and indicated on the drawings. The system shall include but not to be limited to all control equipment, power supplies, signal initiating devices, audible and visual alarm devices, conduit, wire, fittings and other accessories required to provide a complete and operable system. The system shall operate as a non-coded, continuous sounding system.

G. Provide and install required equipment and accessories necessary for the proper operation of the system.

H. Fire system equipment shall be labeled with the manufacturer's name and logo to assure the integration of the complete system.

I. Wiring for the fire alarm system shall be subject to the same restriction as herein before specified for light and power circuitry. (NEC Article 760) Raceways containing conductors shall not contain any other conductors and no A.C. carrying conductors will be allowed in the same raceway with the D.C. fire alarm detection and signaling conductors. Plenum rated fire alarm cable may be used if allowed by the authority having jurisdiction.

J. Equipment shall be listed by Underwriters Laboratories, Inc. or approved by Factory Mutual or as accepted by the authority having jurisdiction. The catalog numbers specified are those of Notifier Fire Alarm Systems. The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes and comply with the requirements of the local authority having jurisdiction over said systems.

K. General requirements as follows:

1. A riser diagram of the complete fire alarm system extension, (Typical riser diagrams are not acceptable).

2. A complete point-to-point installation diagram for the extension. (Typical wiring diagrams are not acceptable).

3. A complete list of current drain requirements during normal supervisory, trouble and alarm condition.

4. Battery standby calculations showing total standby power required to meet the specified system requirements.

L. The operation of any manual station or automatic activation of any smoke detector, or waterflow device shall cause:

1. Fire alarm horns to sound in the building.

2. Evacuation lamps to flash in the building.

3. Automatically shut down fans and/or close doors to prevent the re-circulation of smoke.

4. Notify the Portland Fire Department via a fire alarm dialer and monitoring company.

5. Elevator recall shall be initiated by activation of any elevator lobby smoke detector, the smoke detector in the Elevator Machine Room or the smoke detectors in the elevator shaft and pit. Elevator recall shall cause the elevator to go to the First Floor (Main Egress Level) or alternate floor if the First Floor detector is in alarm. Provide all programmable relay modules.

6. Operation of the 120 volt dual contact heat detector in the elevator Shaft, Elevator Pit or Elevator Machine Room shall cause the shunt trip on the elevator feeder breaker to trip and disconnect electric power to the disconnect switch prior to water flow from the sprinkler system and initiate an alarm in the Elevator Zone of the Fire Alarm System. Provide programmable control relay modules.

7. Detectors for the Elevator shall be zoned separately from detectors throughout the building. Only elevator lobby smoke detectors will initiate special “Fire Service” elevator operation.

M. Each initiating circuit shall be represented on the zone cards in the control panel by an amber trouble LED and a red alarm LED. The LED's for each zone shall be identified on the control panel by custom lettering showing the zone designation. Circuit trouble shall be indicated by the amber LED. Audible trouble and alarm devices shall be supervised. Flashing lights to be supervised.

N. Each initiating circuit shall be electrically supervised for opens and ground faults in wiring, and for short circuit faults and shall be so arranged that a fault condition in any circuit or groups of circuits will not cause an alarm to be sounded. The occurrence of any fault will light a trouble LED and sound the sonolert but will not interfere with the proper operations of any circuit which does not have a fault condition.

O. The installer shall coordinate the installation of the fire alarm equipment with the manufacturer. Conductors and wiring shall be installed per the manufacturers recommendations. It shall be the installers responsibility to coordinate with the manufacturer the correct wiring procedures in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ). Pigtail connections between circuit wires and detector terminals are not acceptable. Devices shall be connected to the circuit line wires.

P. Guarantee equipment and wiring free from inherent mechanical and electrical defects for a period of one year from date of the final acceptance. Before the installations shall be considered completed and acceptable by the awarding authority, a test on the system shall be performed as follows: The contractors job foreman, in the presence of a representative of the manufacturer, a representative of the owner, and the fire department shall operate the

building annunciator and control panel. One half of all tests shall be performed on battery standby power. Where applying heat would destroy any detector, they may be manually operated. The initiating circuit and the signaling circuits shall be opened in at least two locations per zone to check for the presence of correct supervisory circuitry. When the testing has been completed to the satisfaction of both the contractors job foreman and the representatives of the manufacturer and owner, a notarized letter co-signed by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department. The contractor shall leave the fire alarm system in proper working order and without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year from the date of final acceptance by the awarding authority. Prior to final test, the fire department must be notified within a reasonable time of test date (at least 24 hours). The contractor shall provide the necessary personnel and equipment to conduct the tests outlined above.

Q. Detection and signaling circuits shall be run separate from all other conductors. Wiring shall be number 14 solid.

R. Connection within the control equipment and devices shall be made with T and B "stakon" spade terminals. Wiring within the control equipment shall be secured with T and B "tyeraps" and placed in wired gutters.

S. Part numbers specified are for Notifier. Fire alarm system components shall be as follows:

1. Fire alarm control panel: Notifier AFP-200 addressable panel, supply with all modules and relays for complete operational system. Supply with NFPA required battery back-up and charger. Located in electrical room. Provide digital alarm communicator transmittor and all associated telephone interface hardware. Shell contractor responsible for complete operational system.

2. System Smoke Detectors: Notifier FSP-751 low profile, intelligent, addressable photoelectric head with B710LP base - Provide quantity as shown on the plans and at least one over the fire alarm control panel for NFPA compliance. Smoke detectors within apartments shall be system connected but shall not trip the building fire alarm system. The remote annunciator located at the staff reception area shall annunciate all appartment smoke detectors

3. Manual Pull Stations: Notifier NBG12LX - addressable, dual action, key reset station with integral LED visible from the front of the pull station, that blinks when the pull station is addressed by the control panel.

4. Horn/Strobe Alarms: Notifier NS-24-MC-WFR series with adjustable candela settings and adjustable volume taps. Provide synchronized strobes in rooms where more than 2 strobes are visible within the same sightlines, provide Notifier DSM12/24R synchronization modules as required. Provide wire guards for gym horn/strobes. Provide the proper candela strobes for the room sizes as follows:

Room Size	Candela Rating
20' x 20'	15/75 cd
30' x 30'	30/75 cd
40' x 40'	75 cd
50' x 50’	110 cd

Use equivalent ratings for larger rooms per NFPA 72 Code.

5. Strobe Only Alarms: Notifier RSS-24-MC-WFR remote strobes with adjustable candela settings. Provide proper candela for each rooms as outlined above under horn/strobes. Provide wire guards for gym strobes.

6 Duct smoke detectors: Notifier # . For AHU in attic.

7. Heat detectors: Provide Notifier FST-751 (135 fixed temp) or FSD-751R (combination 135 fixed temp and rate of rise) heat detector heads with B-710LP addressable or HD-604 (200 fixed temp) wired to FMM-101 monitor module.

8. Sprinkler devices: Provide Notifier FMM-101 monitor module for each sprinkler alarm or tamper switch.

9. Control relay modules: Provide Notifier FRM-1 programmable relay modules as required to perform other specified or code required contacts to control other life safety alarm function in the building including elevator emergency signal light in cab.

10. Knox Box - #3270 recessed provided and installed by EC.

11. Remote LCD annunciator - Located at reception desk. Shall annunciate apartment smoke detectors. Apartment smoke detectors shall not trip fire alarm system.

2.14 MECHANICAL SYSTEM CONNECTIONS

A. Connect mechanical equipment as shown on the drawings. Control wiring shall be furnished and installed by the Mechanical Contractor.

2.15 NEW ELECTRIC SERVICE

A. A new electric service shall be provided for this facility as indicated on the drawings.

B. Primary cables, pad mount transformer primary connections and transformer pad grounding shall be by Central Maine Power Company.

C. All conduits (primary and secondary) secondary connections and cables shall be by the Electrical Contractor.

2.16 APARTMENT INTERCOM/SECURITY SYSTEMS

A. Provide apartment intercom/security systems as shown on the drawings and specified herein.

B. The system described herein in a TEKTON HP-101 system.

When a visitor presses a pushbutton on the Lobby panel a steady signal will sound in the apartment being called and the handicapped apartment visual signals will flash.

The tenant operates the "talk" button, then the "listen" button for 2-way voice conversation. Operation by the tenant of the door button will activate the door release in the lobby entrance door. This door will also be unlocked by the Postal Lock Option which will give access to the postman.

C. System components (by TEKTON or equal) shall be as follows:

1. Transformer - TEKTON SS 106.

2. Lobby Panel - TEKTON Button and speaker panel with postal lock option and pushbutton/directory panel with (43) buttons minimum, backbox and frame.

3. Apartment Intercom Panel - TEKTON#IR19B (48" AFF in apartments per ADA).

4. Hearing Impaired Apartment Intercom Panel Lamp: Add strobe.

5. Control unit and power supply: TEKTON PK2019.

6. Lobby Door Strike: By G.C.. E.C. shall coordinate and wire.

Lobby panel shall be medium bronze, mounted 48" AFF to top to comply with ADA requirements for wheelchair access.

D. Wiring shall be as required by the manufacturer. Wiring shall be run in raceways where exposed and shall be plenum rated if not run in raceway.

E. Coordinate the installation with the manufacturer. Secure detailed wiring diagrams from the manufacturer and to arrange for the manufacturer to supervise the installation and provide necessary instructions for use and maintenance to the Owner.

2.17 METER STACK

A. Meter stacks shall be Square D "EZ PAK" as shown on the drawings.
Complete meter stack and main breaker by the Electrical Contractor and ringless meters by CMP Co.

2.18 TELEPHONE/DATA

A. Provide and install telephone backboard in electrical room. Twisted pair cabling inside building and phone/data or phone only jacks where indicated on the drawings. Punch down blocks, etc. for an operational system.

B. 4" PVC conduit underground to telephone backboard with pull string. (Entrance cable by Telephone Company). Each apartment to have (2) separate lines.

C. Telephone equipment (phones, processors, etc.) by others.

D. Provide CAT 5E cable, jacks, plates, terminations and testing for complete operational system. All cables shall be run to electrical room tel backboard.

2.19 CABLE TELEVISION

A. Provide and install cabling, jacks and plates inside building where indicated on drawings. Cabling shall terminateon tel backboard in boiler room. Final connections by cable company. Cable and jack type shall be per Cable TV Company.

B. 4" PVC conduit underground to telephone backboard with pull string. (Entrance cable by Cable TV Company).

PART 3 - EXECUTION

3.01 LICENSE

A. Electrical work shall be installed by persons duly licensed by the Electricians Board of the State of Maine.

3.02 COORDINATION

A. It shall be the responsibility of this contractor to coordinate his work with other trades to insure that his work is terminated is a satisfactory manner.

3.03 WORKMANSHIP AND PREPARATION

A. Work shall be executed in a workmanlike manner by experienced electricians in accordance with the most modern engineering practice and shall present a neat appearance when completed. The work shall be carefully laid out in advance and where cutting, channeling, chasing, or drilling of floors, walls, partitions, and ceiling or other surfaces is necessary for the proper installation, support or anchorage of the conduit, raceways or other electrical work, this work shall be carefully done and any damage to the building, piping or equipment shall be repaired by skilled mechanics of the trades involved and at no additional cost to the Owner.

B. After installation, electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials. The interior of boxes and cabinets shall be left clean, exposed surfaces shall be cleaned and plated surfaces polished.

3.04 OBTAINING INFORMATION

A. Obtain information from the manufacturers of the apparatus which is to be provided for the proper methods of installation. Also obtain information from the General Contractor and other Sub-Contractor which may be necessary to facilitate work and the completion of the whole project.

3.05 GIVING INFORMATION

A. The Contractor shall keep himself fully informed as to the shape, size and position of openings and foundations required for his apparatus and shall give full information to the General Contractor sufficiently in advance of the work so that such openings and foundation may be built in advance. Also furnish supports herein specified so the General Contractor may build same in place. In the case of a failure on the part of the Contractor to give proper information as noted above, he shall assume the cost of having the work done.

3.06 RACEWAYS

A. Raceways, where applicable, shall be supported and secured at intervals of not more than 10 ft. with minimum of two supports shall be provided if required. Tie wire or perforated metal straps shall not be used to support or secure raceways or other equipment. Electric metallic tubing shall be supported within 18: of each coupling or connector. In finished areas, furnish and install escutcheons for exposed conduit passing through or entering finished floors or walls.

B. Expansion coupling shall be provided in each raceway crossing building expansion joint and when length of raceway requires expansion coupling, expansion coupling shall have a total minimum expansion of 4" and shall have a flexible bonding conductor. Setting of expansion coupling shall be a function of the temperature at the time of installation. Flexible couplings shall be provided where required.

C. Raceways shall have runs installed parallel or perpendicular to walls, structural members or intersections of vertical planes and ceilings. Field-made bends and offsets shall be avoided where possible, but where necessary, shall be made within an approved hickey or conduit bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways shall be avoided. Care shall be taken to prevent the lodgement of plaster, dirt or trash in raceway boxes, fittings and equipment during the construction. Clogged raceways shall be entirely free of obstructions or shall be replaced. Wooden plugs inserted in concrete or masonry are not acceptable as a base for raceway fastenings nor shall raceways or pipe straps be welded to steel structures. Raceways shall be secured by pipe straps or shall be supported by wall brackets, strap hangers or ceiling trapeze fastened by wood screws on wood, toggle bolts on hollow units, expansion bolts on concrete or brick and machine screws or welded studs on steel work.

3.07 OUTLETS

A. Each outlet in the wiring or raceway systems shall be provided with an outlet box to suit the conditions encountered. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the National Electrical Code. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved.

B. Ceiling and bracket outlet boxes shall be not less than 4" except that smaller boxes may be used where required by the particular fixture to be installed. Boxes shall be installed in a rigid and satisfactory manner and shall be fastened directly with wood screws on wood, bolts and expansion shield on concrete or brick, toggle bolts on hollow masonry units and machine

screws or welded threaded studs on steel work. Threaded studs driven in by a powder charge and provided with lock washers and nuts are acceptable in lieu of wood screw, expansion shields or machine screws if permitted by local authorities.

3.08 FIXTURES

A. Incandescent and fluorescent fixtures shall be supported by building structural elements independent of furred or suspended ceilings.

B. Subsequent to review of shop drawings and prior to ordering fixtures, verify voltage at each fixture, also consult with others to determine the type of ceiling and ceiling suspension system in each and every room and order fixtures to suit and fit the particular ceiling and ceiling suspension system. Any extra costs because of failure on the part of this Contractor to verify voltage or ceiling requirements shall be paid for by this Contractor. It is not the intent of fixture catalog numbers shown to classify the voltage, ceiling or ceiling suspension.

3.09 WIRING DEVICES

A. Switches and convenience outlets shall have a rating as indicated on the drawings. Light switches shall be silent type. Outlets connected to exposed conduits shall be installed in a surface mounted, conduit device box, 4-1/2" long by 2-1/8" wide and with a suitable cover for the device to be installed (box shall be galvanized). Plates on finished walls and on boxes connected to concealed cable and conduits shall be as noted in the specifications.

3.10 INTENT OF DRAWINGS

A. It is not intended that the drawings show in detail every conduit, junction box, etc., but material necessary to complete the electrical system in accordance with the best practices of the trade and to the complete satisfaction of the Architect, shall be furnished without additional recompense under this section of the specifications. No deviation from the layout shall be made without written approval from the Architect.

3.11 RECORD DRAWINGS

A. During the progress of the work, keep a set of drawings marked up to record deviations and changes from the Contract Drawings due to field conditions, change orders, amendments, revisions, addenda and other reasons to represent an accurate record of all work as actually installed. Include an accurate layout of all in-slab, under-slab, and buried conduits.

B. Deviations from the Contract Documents shall be approved by the Architect before installation.

C. At the completion of the work, furnish to the Architect a complete set of prints of the original Contract Drawings on polyester film, corrected in a neat manner to reflect all the above changes and representing an accurate record of all work as actually installed.

D. The record drawings shall be submitted to the Architect for approval and corrected as deemed necessary.

E. After approval, the record drawings shall become the property of the Owner.

3.12 INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

A. A the completion of the work, turn over to the Owner, one (1) set of operating and maintenance instructions of equipment and systems. Submit name and address of nearest available source of repair service and replacement equipment and parts to the Owner and Architect. Explain and demonstrate the operation of the fire alarm system and the apartment intercom/security system to the Owner's representative. The manufacturer's field technician shall be present at this demonstration.

B. Arrange data in complete sets, properly indexed and marked.

C. Data shall include a complete set of shop drawings.

D. Material shall first be submitted in preliminary form for review by the Architect. After review, submit two (2) copies in bound volumes to the Architect for distribution.

END OF SECTION