# CHESTNUT STREET LOFTS

URBAN REVITALIZATION PROJECT
BY CHESTNUT STREET, LLC

## SPECIFICATIONS

Technical specifications and administrative requirements for the Project are divided into 16 Divisions as follows. Division 1 General Requirements apply to all work for the Project.

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| Division 1 | General Requirements | Division 9 | Finishes |
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## CONDITIONS OF CONTRACT

The following Conditions of Contract are included as if bound with this document:
Owner Contractor Agreement:

1. AIA A101/CMa-1992, Stipulated Sum, Construction Manager-Adviser Edition.

General Conditions:

1. AIA A201/CMa-1992, for Construction, Construction Manager-Adviser Edition.

- Special Conditions:
  1. Completed construction includes exposed structural and mechanical components commonly hidden by finish materials. Installation to be completed carefully so that components are clean, not damaged, and suitable as a final finish.

1/2/06

# PROJECT TEAM

- Project Location

29 Chestnut Street
Portland ME 04101

- Owner

Chestnut Street LLC
1 India Street
Portland ME 04101

- Architect

TFH Architects
100 Commercial Street
Portland ME 04103

- Civil Engineer

Land Use Consultants
996 Riverside Street
Portland ME 04103

- Structural Engineer

Structural Design Consulting
22 Oakmont Drive
Old Orchard Beach ME 04064

- Mechanical Engineer

Whitney Engineering
10 Danforth Street
Portland ME 04101

- Electrical Engineer

Bennett Engineering
7 Bennett Road
P.O. Box 297
Freeport ME 04032

END PROJECT TEAM

CHESTNUT STREET RESIDENTIAL LOFTS

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# DIVISION 1 - GENERAL REQUIREMENTS

## SECTION 01000 - PROJECT REQUIREMENTS

Summary:

1. The Project consists of 37-unit "open" residential development on eight floors, each unit to have a toilet/kitchen/storage/utility core; no other partitions to be provided within the units as part of the base bid. Ground floor shall contain approximately 2,200 square feet of office/retail space; entrance lobby; and nine covered and 28 uncovered parking spaces. Construction to be steel frame with metal concrete filled deck; applied fire rate protection where required, 2 hours all structural members; separation between units to be 1 hour. This structure will have a full basement with a ceiling height no less than 9'-0" as measured from finished slab to underside of pre-cast concrete above. Elevator with stop in basement and sump pit.

New Construction: ..... Multi-family Residential

Size: ..... Approximately 50,000 gross square feet
54,116 including basement

Building Codes:....Life Safety 101, Int'l. Building Code (IBC) Type 1B

Owner occupancy: ..... No

Project Requirements:

### GENERAL CONTRACTOR RESPONSIBILITIES

Project management, supervision, coordination, safety program.

Field layout, submittals, testing services, quality control.

Transportation of all contract materials to and from site.

Provision of all accessory types of items necessary to complete work, such as mortar, fasteners, hurricane ties and anchor bolts.

General liability, workman's compensation.

Builder's risk insurance, building permits, scheduling inspections.

Temporary service (electrical, water, sanitary, power, heat, fire protection, enclosures/barriers).

Coordination with utility providers for new services.

Erosion control fence, dust and water control.

Construction cleaning, final cleanup, legal disposal of waste.

Site Security.

Record Drawings of as-built conditions.

### OWNER RESPONSIBILITIES

Reasonable, unimpeded access to the site

Timely decision making

Third-party materials testing (compaction, concrete strength, etc.)

Site surveys

Permits:

1. Apply for, obtain, and pay for building permits, other permits, and utility company backcharges required to perform the work. Submit copies to Architect.

Intent:

1. Drawings and specifications are intended to provide the basis for the proper completion of the Project suitable for the intended use of the Owner.
2. Items not expressly set forth but which are reasonably implied or necessary for the proper performance of this work shall be included.

Coordination:

1. Coordinate the work of all trades especially those involving design build such as heating, ventilating, plumbing, sprinkler, electrical and technology work.
2. Prepare coordination drawings for areas above ceilings where close tolerances are required between building elements and mechanical and electrical work.
3. Verify location of utilities and existing conditions. Notify Architect of conditions differing from those indicated on the Drawings.
4. Verify dimensions on Drawings with dimensions at the Project. Do not scale Drawings.

Cutting and Patching:

1. Provide cutting and patching work to properly complete the Project.
2. Do not remove or alter structural components without written approval.
3. Cut with tools appropriate for materials to be cut.
4. Patch with materials and methods to produce patch which is not visible from a distance of five feet.
5. Do not cut and patch in a manner that would result in a failure of the work to perform as intended, decrease fire performance, decrease acoustical performance, decrease energy performance, decrease operational life, or decrease safety factors.

Field Engineering:

1. Verify and locate utilities, existing facilities, and equipment.
2. Survey and layout improvements, utilities, structures, and components.

Project Meetings:

1. Arrange for a preconstruction conference prior to start of construction. Meeting shall be attended by Owner, Architect, Contractor, and major subcontractors.
2. Arrange for progress meetings once a month during construction, prior to application for payment. Record minutes and distribute promptly.

Submittals:

1. Submit a project schedule and update at least monthly. Submit for approval all reproducible submittals listed in individual sections: Shop drawings, reviewed and annotated by the Contractor,; product data; samples, 3 sets plus range samples where applicable; test reports; warranties.
2. Include details of construction and adjacent construction in shop drawings. Clearly indicate any deviations from requirements of the contract documents. Fabricate materials from approved shop drawings only.

Quality Assurance:

1. Comply with applicable codes, regulations, ordinances and requirements of

authorities having jurisdiction, including accessibility guidelines where applicable. Submit copies of inspection reports, notices and similar documents to Architect.
2. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years.
3. Use experienced installers. Furnish evidence of experience if requested.
4. Deliver, handle, and store materials in strict accordance with manufacturer's instructions.
5. Use of any supplier or subcontractor is subject to Owner's approval.
6. Engage and pay for testing agencies as required. Refer to individual sections for additional requirements.

Temporary Facilities:

1. Provide temporary facilities and connections as required for the proper completion of the project.
2. Provide and maintain temporary utility services.
3. Provide temporary protection for adjacent areas to prevent contamination by construction dust and debris.
4. Provide temporary barricades as necessary to ensure protection of the public.
5. Provide suitable waste disposal units and empty regularly. Do not permit accumulation of trash and waste materials.
6. Provide temporary sanitary facilities.
7. Maintain egress within and around construction areas.
8. Provide fire extinguishers in work areas during construction.
9. Provide temporary protection for adjacent construction. Promptly repair any damage at no additional cost to the Owner.
10. Construction easements: Provide owner with plan of any required construction areas required outside the property line. Owner will obtain necessary easements.

Products and Substitutions:

1. Provide products and materials specified. Request Architect's selection of colors and accessories in sufficient time to avoid delaying progress of the work.
2. Submit requests for substitutions shall be in writing, including reasons. Submit sufficient information for Architect to evaluate proposed substitution.
3. Remove and replace work which does not conform to the contract documents at no additional expense to the Owner.

Installation:

1. Inspect substrates and report unsatisfactory conditions in writing.
2. Do not proceed until unsatisfactory conditions have been corrected.
3. Take field measurements prior to fabrication where practical. Form to required shapes and sizes with true edges, lines and angles. Provide inserts and templates as needed for work of other trades.
4. Install materials in exact accordance with manufacturer's instructions and approved submittals.
5. Install materials in proper relation with adjacent construction and with proper appearance.
6. Restore units damaged during installation. Replace units which cannot be restored at no additional expense to the Owner.
7. Refer to additional installation requirements and tolerances specified under individual specification sections.

Closeout:

1. Prepare punchlist for remaining work for review by the Architect.
2. Complete punchlist items promptly at no additional expense to the Owner.

3. Submit accurate record documents of building and site.
4. Submit operating manuals, maintenance manuals, and warranty information.
5. Obtain and submit copy of occupancy permits.
6. Train Owner in use of building systems.
7. Remove temporary facilities and provide final cleaning and touch-up.
8. Restore portions of building, site improvements, landscaping and other items damaged by construction operations to the satisfaction of the Architect at no additional expense to the Owner.

SECTION 01030 - ALLOWANCES

Summary:

1. Include scheduled allowances in the project cost; allowance is for providing items. Submit invoices to indicate actual quantities of materials delivered and costs. Indicate amounts of applicable trade discounts.

Allowances:

1. Project sign to be approved by Architect and Owner: $500.

SECTION 01033 - ALTERNATES

Summary:

1. Submit price for each alternate. Include cost of modifications to other work to accommodate alternate. Owner will determine which alternates are selected for inclusion in the Project.

Alternates:

1. Add alternate 1: Stair to roof (delete alternating tread stair), rooftop deck with concrete pavers, and penthouse structure.
2. Add alternate 2: stained concrete floor finish at Entry Lobby- Dry-Shake Method (Portland Cement Association 708-966-9559,'Finishing Concrete Slabs with Color and Texture'), color to be determined, metal wainscote at lobby with paint-grade poplar base and cap.

END OF DIVISION 1

# DIVISION 2 - SITEWORK

## SECTION 02220 - DEMOLITION

Summary:

1. Provide removal and legal disposal of materials.

Submittals:

1. Submit proposed location for disposal of materials, and permit if applicable.

Salvage:

1. Carefully remove curbing and pavers on site. Store and protect stock for reuse.

Demolition:

1. Perform demolition operations to prevent dust and pollutant hazards.
2. Remove all monitoring wells and abandoned utilities and any associated materials.

## SECTION 02230 - SITE CLEARING

Summary:

1. Provide temporary erosion control, siltation control, and dust control.
2. Provide temporary protection of adjacent property, structures, benchmarks, and monuments.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

## SECTION 02300 - EARTHWORK

Summary:

1. Provide excavation, filling, compaction, and grading for buildings, site improvements, and utilities.
2. Provide suitable materials for subbase, drainage fill, and backfill for slabs, pavements, and improvements.
3. Provide rock excavation without blasting unless authorized.
4. Provide additional materials from offsite if required.
5. Provide removal and legal disposal of excavated materials.
6. Provide erosion control and control of runoff during earthwork operations.

Submittals:

1. Submit list and source of materials from offsite, and submit proposed location for disposal of excess materials.

Products:

1. Subbase Material: Graded mixture of natural or crushed gravel, crushed stone or slag, and natural or crushed sand.
2. Subbase for bituminous setting beds: crushed stone type A.
3. Drainage Fill: Washed, evenly graded mixture of crushed stone or gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 200 sieve.
4. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other unsuitable materials.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Provide compaction under structures, building slabs, steps, pavements, and walkways; 95 percent maximum density, ASTM D 698, standard Proctor.
3. Provide compaction under lawns or unpaved areas; 90 percent maximum density, ASTM D 698, standard Proctor.
4. Provide grading tolerance for lawns, unpaved areas, and walks of plus or minus 1 inch.
5. Provide grading tolerance for pavements of plus or minus 1/2 inch.
6. Provide grading tolerance for fill under building slabs of plus or minus 1/2 inch

SECTION 02743 - BITUMINOUS CONCRETE PAVING

Summary:

1. Provide bituminous concrete paving over prepared subbase.

Submittals:

1. Submit product data.

Products:

1. Bituminous material shall conform to Maine DOT specification, Section 702.01, viscosity grade AC-20. Nominal asphalt content shall be 6%. Aggregates shall conform to MDOT specifications, Section 703.09 Grade A for bituminous setting bed, Grade B for Pavement base course, Grade C for pavement top course, D for sidewalk base and top course.
2. Apply paint in accordance with MDOT Standard Specifications, Section 627.04, 627.05, and 627.06. (Delete references to glass beads.) Stripe parking lot spaces and any other pavement graphics shown/detailed on Drawings with 4" wide striping. Fire lanes, crosswalks, etc. to be marked as shown on Drawings. The Universal Handicap Symbol, as detailed on Plans, shall be painted at the designated handicapped stalls. The drop-off strips between the handicapped stalls shall be painted solid blue with non-skid surfaces.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Provide construction tolerances as follows:
   a. Base Course Thickness: Within 1/2 inch.
   b. Surface Course Thickness: Within 1/4 inch.
   c. Base Course Surface Smoothness: Within 1/4 inch.
   d. Surface Course Surface Smoothness: Within 3/16 inch.

SECTION 02780 - UNIT PAVERS

Summary:

1. Provide exterior brick pavers over prepared setting bed.

Submittals:

1. Submit product data, samples, shop drawings, 4 foot by 4 foot mockup.

Products:

1. Products:

2. Brick Pavers:
   a. Class: ASTM C 902, Weather Class SX for use subject to freezing.
3. Setting Bed at sidewalks: bituminous bed according to MDOT and City of Portland specifications.
4. Border course of brick pavers to be mortared to pavement base.
5. Setting Bed: Mortar over concrete slab where shown on drawings.
6. Joint Treatment: Sand graded according to MDOT.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Construction Tolerance: Unit-to-unit offset tolerance of 1/16 inch from flush, 1/8 inch in 2 feet and 1/4 inch in 10 feet from level or required slope.

SECTION 02754 - CEMENT CONCRETE PAVING

Summary:

1. Provide cast-in-place concrete paving over prepared subbase.

Submittals:

1. Submit product data, mix design.

Products:

1. Concrete: ASTM C 150, Type 1, Portland cement; ASTM C 33, normal weight aggregates; potable water.
   a. Design Mix: ASTM C 94, 3000 psi, 28 day minimum compressive strength.
   b. Slump Limits: 8 inches minimum with superplasticizer, 3 inches otherwise.
   c. Air Content: 5 to 8 percent.
   d. Finish: Broom.
2. Wire Mesh: Welded plain steel wire fabric, ASTM A 185.
3. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.
4. Fabricated Bar Mats: Steel bar or rod mats, ASTM A 184, using ASTM A 615, Grade 60 steel bars.
5. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60.
6. Hook Bolts: ASTM A 307, Grade A threaded bolts.
7. Liquid-Membrane Forming and Sealing Curing Compound: ASTM C 309, Type I, Class A.
8. Bonding Compound: Polyvinyl acetate or acrylic base.
9. Epoxy Adhesive: ASTM C 881.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Construction Tolerance: 1/8 inch in 10 feet for grade and alignment of top of forms; 1/4 inch in 10 feet for vertical face on longitudinal axis.

SECTION 02770 - CURBS AND GUTTERS

Summary:

1. Provide granite curbs to match adjacent properties.

Submittals:

1. Submit product data, samples.

Products:

1. Contractor to supply and install granite curbs to edges of bituminous paving and sidewalk. Curbing to be installed in conformance with MDOT specifications, Section 609.04

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Construction Tolerance: 1/8 inch in 10 feet for grade and alignment; 1/4 inch in 10 feet for vertical or sloped face on longitudinal axis.

SECTION 02710 - DRAINAGE SYSTEMS

1. Perforated Drain Pipe: Provide 4" perforated / corrugated PVC at exterior of structure, at 6" below basement concrete slab; extend 8'-0" from structure and tie into storm sewer extension, provided by Owner. Install perforations down. Provide 4 Schedule 40 PVC for cleanouts to grade or access inside basement.

2. Site Drainage: Provide positive drainage away from all building edges – 6" pitch over the first 10' minimum.

3. Radon Venting: Install 4" perforated PVC pipe in 6" of crushed stone under the basement slab, perimeter plus two cross-overs each way. Provide 16" gravity vent duct to roof.

SECTION 02800 – UTILITIES

1. Connect sanitary, storm drainage system to municipal system. Separate domestic water and fire suppression connections. Provide backflow preventer. Underground power to pad located transformer to the rear of the structure.
2. Provide booster pump for required pressure of potable water system.
3. Comply with requirements for class of standpipe fire system.
4. Provide municipal gas service, metering, and gas distribution system to each unit.

SECTION 02810 - SITE IMPROVEMENTS AND AMENITIES

Summary:

1. Provide site improvements and furnishings.

Submittals:

1. Submit product data, samples, shop drawings, maintenance data.

Products:

1. Bicycle Racks: Galvanized steel.
2. Site Lighting: Pole mounted fixtures.
3. Parking bollards: Concrete filled 6" diameter steel pipe, painted 3 coats.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 02820 - FENCES AND GATES

Summary:

1. Provide chain link fence and gates.

Submittals:

1. Submit product data.

Products:

1. Steel Chain-Link Fence Fabric:
   a. Mesh and Wire Size: 1-3/4 inch 11 gage
   b. Coating: Galvanized
2. Framework: Galvanized steel
3. Gates: Swinging type.
4. Framing and Fittings: Posts, rails, tension wire, and accessories.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with ASTM F 567.

SECTION 02900 - PLANTING

Summary:

1. Provide Landscape Work:
   a. Trees, shrubs, plants, and ground cover.
   b. Finish grading and lawns.
   c. Topsoil and soil amendments.
   d. Initial maintenance of landscape materials.
2. Provide balled and burlapped plants and trees graded to American Standard for Nursery Stock, ANSI Z60.1 in accordance with materials approved by the City of Portland Arborist.

Submittals:

1. Submit as-built planting plan, product data, warranty, maintenance data.

Products:

1. Plant Materials:
   a. Refer to plans and schedule.
2. Seeded Lawns
3. Soil Amendments: Based on laboratory recommendations.
4. Landscape Materials:
   a. Gravel: Water-worn gravel.
   b. Mulch: Shredded bark.
   c. Anti-Desiccant: Emulsion type, film-forming.
   d. Plastic Sheet: Black polyethylene, 8 mils.
   e. Filtration Fabric: Water permeable fiberglass or polypropylene fabric.
   f. Wrapping: Tree-wrap tape.
   g. Stakes and Guys: New hardwood, treated softwood.
   h. Metal Edging: Commercial steel edging.
   i. Wood Headers and Edging: All pressure treated southern yellow pine.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

END OF DIVISION 2

# DIVISION 3 - CONCRETE

## 03200 CONCRETE REINFORCEMENT

Re-bar: Reinforcing bars; ASTM A 615; Grade 60; deformed. Provide in concrete piers and footings and in concrete pads as indicated on foundation drawings.

## SECTION 03300 - CAST-IN-PLACE CONCRETE

Summary:

1. Provide plant-mixed cast-in-place concrete.
   a. Footings, foundations, and basement walls.
   b. Slabs-on grade and elevated slabs.
   c. Paving base and pads.
   d. Exterior planter retaining wall footings.
   e. Exterior concrete stairs.
2. Comply with ACI 301, Specifications for structural Concrete for Buildings, ACI 318, Building Code Requirements for Reinforced Concrete, and CRSI Manual of Standard Practice.
3. Compressive Strength at 28 days: 3000 psi for footings and foundation walls and 4000 psi for slab-on-grade and elevated slabs. Air Entrainment: 6% ±1% for exterior concrete. Water/Cement Ratio: 0.48 maximum for 4000 psi concrete and 0.58 for 3000 psi concrete. Slump: General: not less than 1"; not more than 4" Footing, Piers and Pads: not less than 1"; not more than 3" HRWR Admixtures: not more than 8" Aggregate Size: 3/4" maximum.
4. Concrete slab on grade: 4" thick, reinforced with polypropylene fibers.
5. Concrete foundation wall: Unless Otherwise Noted: 12" thick; reinforced with #5 @18" horizontal and vertical on both faces.
6. Wall footing: Unless Otherwise Noted: 28" wide, 12" thick; reinforced with (3) # 5 bars bottom. Placed on undisturbed soil or compacted fill.
7. Concrete footings: Provide reinforced column spread footings as indicated on drawings.
8. Concrete stair finish: nonslip broom finish.
9. Exterior flatwork and stairs: DCI -S Corrosion Inhibitor by Grace Construction Products or Rheocrete CNI Corrosion Inhibitor by Master Builders. 3 1/2 gal/cy. added at Batch Plan
10. Concrete finished floor: Floors to have a 'super-flat' smooth finish using power trowelling following recommendations of Portland Cement Association.
11. Sealer at finish floors: siloxane or equal, submit compatibility.
12. Owner to provide independent testing laboratory to sample concrete properties.

Submittals:

1. Submit product data including compatibility, shop drawings, mix design, test reports.

Products:

Finish:

1. Smooth rubbed and polished finish unless noted.

END OF DIVISION 3

# DIVISION 4 - MASONRY

## SECTION 04800 - UNIT MASONRY

Summary:

1. Provide Unit Masonry Construction:
   a. Concrete block bearing walls and non-bearing partitions.
   b. Freestanding site masonry walls.
   c. Planting bed perimeter wall.
2. Repair damaged masonry and repoint damaged joints.

Submittals:

1. Submit product data, samples, shop drawings, 4 foot by 4 foot mockup, test reports.

Products:

1. Products:
   a. Trendstone Masonry Units
   b. Trendstone Monumental Masonry Units
2. Concrete Masonry Units:
   a. Concrete Masonry Units: ASTM C 90, 1500 f'm compressive strength, normal weight.
   b. Size: Face dimension of 1-9/16, 3-9/16, 7– 9/16 inches high by 7-5/8, 15-5/8, 23-5/8 inches long by width required for application.
   c. Special Finish: Standard aggregate, split face finish.
   d. Special Finish: Standard aggregate, ground-face finish factory applied acrylic, all exposed faces ground and finished. Ground chamfer at intersections of planes and masonry openings.
   e. Split face Color as selected by Architect
   f. Ground-face color: as selected by Architect
   g. Bond Pattern: Running
   h. Bond Pattern at Pilasters: Running
   i. Bond Pattern at Lintel and above storefront Courses: Soldier (Monumental units)
   j. Bond Pattern at screen walls: Running with open spacing.
3. Mortar and Grout:
   a. Mortar Mix: ASTM C 270, Type S, for reinforced masonry, masonry below grade and masonry in contact with earth and ASTM C 270, Type N, for above-grade loadbearing and nonloadbearing walls and parapet walls and for interior loadbearing and nonloadbearing partitions.
   b. W.R. Grace DRY-BLOCK® (or approved equal) water-repellent mortar additive
   c. Mortar Materials: Ready mixed, ASTM C 207, Type S materials.
   d. Mortar Aggregate: Special color, ASTM C 144.
   e. Color: Colored pigmented mortar to match CMU.
4. Reinforcing Steel:
   a. Reinforcing Bars: ASTM A 615, Grade 60.
   b. Deformed Reinforcing Wire: ASTM A 496.
5. Joint Reinforcing: Welded wire with deformed side rods.
   a. Steel Wire: 9 gage (.1875 inch) galvanized
   b. Type: Ladder or truss type.
6. Ties and Anchors:
   a. Bent Wire Ties: Galvanized steel.

7. Masonry Accessories:
   a. Nonmetallic expansion joint strips.
   b. Preformed control joint gaskets.
   c. Bond breaker strips.
   d. Weep sash and tubes.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with PCA Recommended Practices for Laying Concrete Block, Brick Institute of America Tech Notes, and NCMA TEK Bulletins.
3. Comply with cold weather and warm weather protection procedures as recommended in BIA Tech Notes.
4. Provide fire-rated assemblies complying with ASTM E 119.
5. Sawcut units when required. Maintain uniform joint width. Provide full bed, head and collar joints except at weepholes.
6. Install weep holes and vents at proper intervals (16" O.C. and 2" long, above bed joints, typical) at courses above grade, above flashing, and at any water stops over windows, doors and beams.
7. Install lintels and accessories in masonry construction.
8. Coordinate installation of flashings.
9. Comply with applicable codes and regulations for spacing of ties and horizontal reinforcing.
10. Provide expansion and control joints in accordance with referenced publications.
11. Remove and replace damaged units.
12. Clean with water and recommended cleaner.
13. Clean severe stains at block using Sureclean Burnished custom masonry cleaner.
14. Field apply continuous Trendcoat acrylic clear coating.

END OF DIVISION 4

# DIVISION 5 - METALS

## SECTION 05120 - STRUCTURAL STEEL

Summary:

1. Provide structural steel for building construction and related anchors, fasteners, and connectors.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Standards: AISC, Code of Standard Practice for Steel Buildings and Bridges, and applicable regulations.
2. Steel Materials:
   a. Structural Wide Flange Shapes: ASTM A 992, Grade 50.
   b. Structural Steel Shapes, Plates, and Bars: ASTM A 36.
   c. Cold-Formed Steel Tubing: ASTM A 500, Grade B.
   d. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.
   e. Anchor Rods: ASTM A 307, nonheaded type.
3. Auxiliary Materials:
   a. Nonmetallic Shrinkage-Resistant Grout: Premixed nonmetallic grouting compound, CE CRD-C621.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with AISC codes and specifications and with AWS Structural Welding Code.
3. Comply with AISC erection tolerances.

## SECTION 05310 – STEEL DECK

Summary:

1. Provide steel floor and roof deck units and related anchors, fasteners, and connectors.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Standards: AISI, Specification for the Design of Cold-Formed Steel Structural Members; and SDI Design Manual for Composite Decks, form Decks, and Roof Decks.
2. Steel Materials and Finish:
   a. Type: Steel for galvanized metal deck, ASTM A 108.
   b. Steel Shapes: ASTM A 36.
   c. Shear connectors, strap type ASTM A 570, Grade D.
   d. Galvanizing: ASTM A 525, G60.
3. Auxiliary Materials:
   a. Metal cover plates.

b. Flexible closure strips.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 05400 - COLD FORMED METAL FRAMING

Summary:

NOTE: Exterior sheathing: refer to 07410: Manufactured Roof and Wall Panels
Interior load-bearing steel-stud walls: refer to 09260: Gypsum Board Assemblies..

1. Provide Cold Formed Metal Framing Units:
   a. Steel joists.
2. Design for deflection criteria not to exceed L/600 for masonry.
3. Tolerances: Fabrication tolerance 1/8 inch in 10 feet; erection tolerance, 1/16 inch.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Joist Framing: C-shaped load-bearing steel joists.
2. Framing accessories, including bracing, bridging, solid blocking, plates, hangers, closers, reinforcement plates, anchors, clips, fasteners.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with AISC codes and specifications and with AWS Structural Welding Code.

SECTION 05500 - METAL FABRICATIONS

Summary:

1. Provide metal fabrications:
   a. Rough hardware.
   b. Steel framed stairs.
   c. Handrails and railings.
   d. Roof access alternating tread stair.
   e. Ladders.
   f. Loose bearing and leveling plates.
   g. Loose steel lintels.
   h. Miscellaneous steel trim.
   i. Prefabricated building columns.
   j. Balcony roof canopy exposed support.
2. Tolerances: Fabrication tolerance 1/8 inch in 10 feet; erection tolerance, 1/16 inch.

Submittals:

1. Submit product data, shop drawings.

Products:

Site Fencing and Basement storage area partitions: refer to 02820-Fences and Gates

1. Steel Plates, Shapes and Bars: ASTM A 36.
2. Steel Tubing: ASTM A 500 or A 501.
3. Steel Pipe, Black Finish: ASTM A 53.
4. Trench drain covers-Balco
5. Guard rails, handrails, and stair rails infill panels: 2" X 2" galvanized welded wire panels .236 steel ga.
6. Aluminum natural finish alternating tread stair at 68 degrees, approximately 11' floor to roof height, 23" wide, with separate wall attached handrail by Lapeyre Stair, Inc. (www.lapeyrestair.com)
7. Steel Finish: Primed
8. Fasteners: non-corrosive, suitable for service intended.
9. Zinc-Coating: Hot-dip galvanized coating for materials in exterior assemblies or exterior walls or as noted in drawings.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with ASTM E 985 for handrail and railing structural performance.
3. Comply with AISC codes and specifications and with AWS Structural Welding Code.

END OF DIVISION 5

# DIVISION 6 - WOOD AND PLASTICS

## SECTION 06100 - ROUGH CARPENTRY

Summary:

1. Provide Rough Carpentry:
   a. Misc. framing with dimension lumber.
   b. Wood grounds, nailers, blocking, curbing.
   c. Wood furring.
   d. Backing panels.
   e. For interior partitions, refer to 09260 'Gypsum Board Assemblies'

Submittals:

1. Submit product data.

Products:

1. Lumber Standards and Grade Stamps: PS 20, American Softwood Lumber Standard and inspection agency grade stamps.
2. Construction Panel Standards: PS 1, U.S. Product Standard for Construction and Industrial Plywood; APA PRP-108.
3. Wood Framing Standards: NFPA House Framing Manual.
4. Preservative Treatment: ACQ pressure treatment.
5. Fire-Retardant Treatment: AWPA C20 for lumber and AWPA C27 for plywood; noncorrosive type.
6. Dimension Lumber:
   a. Light Framing: Stud, No. 3 or Standard grade.
7. Boards:
   a. Exposed Boards: 15 percent moisture content maximum
   b. Concealed Boards: 19 percent moisture content maximum
8. Miscellaneous Lumber, Blocking and Nailers:
   a. Moisture Content: 19 percent maximum
   b. Grade: Standard grade light framing.
9. Construction Panels:
   a. Plywood Backing Panels: APA C-D Plugged Exposure 1 with exterior glue, fire-retardant treated.
10. Gypsum Sheathing where required.:
    a. Gypsum Material: Gypsum sheathing board with water-resistant core.
    b. Surfaced Gypsum Material: Glass-fiber-surfaced gypsum sheathing board.
    c. Type: Regular ASTM C 79.
    d. Type: Type X fire-resistant ASTM C 79.
11. Auxiliary Materials:
    a. Polyethylene Air Infiltration Barrier: High density polyethylene.
    b. Polyolefin Air Infiltration Barrier: Woven polyolefin sheet.
    c. Ice and Water Shield, Deck protector by Grace.
    d. Sill Sealer Gaskets: Glass fiber strip resilient insulation.
    e. Framing Anchors and Fasteners: Non-corrosive, suitable for load and exposure.
    f. Fasteners at preservative treated lumber: G-185 (double dipped galvanized) or stainless steel.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

2. Provide nailers, blocking and grounds where required. Set work plumb, level and accurately cut. Provide blocking for kitchen and bathroom accessories and for future bathroom grab bars at all bathrooms.
3. Provide framed opening for both ADA bathroom door and standard door (size indicated on schedule) at openings indicated in door schedule.
4. Provide separation between ACQ lumber and metal with Vycor Deck Protector membrane by Grace.
5. Comply with manufacturer's requirements for treated materials.

SECTION 06401 - EXTERIOR ARCHITECTURAL WOODWORK

Summary:

1. Provide Exterior Architectural Woodwork:
   a. Ornamental items.

Submittals:

1. Submit product data, samples, mockup of each type.

Products:

1. AWI Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards."
2. Preservative Treatment: ACQ.
3. Fire-Retardant Treatment: AWPA C20 for lumber and AWPA C27 for plywood; non-corrosive exterior type.
4. Exterior Decking
   a. 5/4" X 6" Correct-Deck or approved equal.
5. Auxiliary Materials:
   a. Nails: Stainless steel, aluminum or double hot-diped galvanized siding nails.
   b. Screws and Anchors: Noncorrosive, type required for secure anchorage.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with standards referenced.
3. Provide trim for scribing and site cutting.
4. Install work plumb, level and in proper alignment.
5. Provide work free from tool marks and blemishes.
6. Securely fasten to substrates.
7. Install in lengths to minimize joints and seams.
8. Touch-up damaged or abraded finishes.

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

Summary:

1. Provide Interior Architectural Woodwork:
   a. Casework- cabinets below wall-hung boilers
   b. Countertop at mailroom.
   c. Shelving at closets and laundry areas.

Submittals:

1. Submit product data, samples, mockup of each type.
2. Submit standard color range for approval.

Products:

1. AWI Standards: Architectural Woodwork Institute (AWI) "Architectural Woodwork Quality Standards."
2. Fire-Retardant Treatment:
   a. Lumber: AWPA C20, non-corrosive interior type.
   b. Plywood: AWPA C27, non-corrosive interior type.
3. Interior Wood Casework:
   a. Install manufactured cabinets and countertops.
   b. Custom birch veneer plywood cabinet below boilers at each unit.
   c. Provide plastic laminate counter at mailroom.
4. Shelving:
   a. Shelf Supports: Surface mounted slotted standards.
   b. Closet poles: Chrome plated steel with intermediate supports.
   c. Shelving: plastic coated wire shelves.
5. Auxiliary Materials:
   a. Screws: FS FF-S-111, countersunk.
   b. Nails: FS FF-N-105, countersunk.
   c. Anchors: Type required for secure anchorage.
      1). Dull satin sheen.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with standards referenced.
3. Provide trim for scribing and site cutting.
4. Install work plumb, level and in proper alignment.
5. Provide work free from tool marks and blemishes.
6. Securely fasten to substrates.
7. Touch-up damaged or abraded finishes.

END OF DIVISION 6

# DIVISION 7 - THERMAL AND MOISTURE PROTECTION.

- GENERAL- The building thermal envelope shall meet the requirements of the Maine State Energy Code.

## SECTION 07111 - BITUMINOUS DAMPPROOFING

Summary:

1. Provide Bituminous Dampproofing:
   a. Exterior surfaces of foundation walls.

Submittals:

1. Submit product data.

Products:

1. Cold-Applied Asphalt Emulsion Dampproofing:
   a. Spray grade, ASTM D 1227, Type III or IV.
   b. Protection Course: Compatible with dampproofing.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

## SECTION 07210 - BUILDING INSULATION

Summary:

1. Provide Building Insulation and Vapor Retarders:
   a. Under slabs-on-grade, board type.
   b. Foundation walls, board type.
   c. Acoustic insulation at interior partitions, blanket type.
   d. Sheet vapor retarders.

Submittals:

1. Submit product data.

Products:

1. Board Insulation:
   a. Molded expanded polystyrene, rigid, ASTM C 578.
   b. Polyisocyanurate board, rigid, FS HH-I-1972/1, Class 2 at roofs.
   c. Glass fiber board, semi-rigid, ASTM C 553, Class B-4where required.
   d. Vapor Retarder: Integral vapor retarder as required for application.
2. Provide continuous vapor retarder on warm side of all insulation of garage ceilings; foil facing to inside; seal all joints with tape; 4 mil film, 5/16" double bubble with facing on both sides; complying with ASTM C 1224; foil on warm side, white polyethylene on cold side; Fi-Foil RBI Shield or equal; www.fifoil.com, 800-448-3401.
3. Vapor Retarder (Not Integral with Insulation):
   Reinforced 2-ply polyethylene, 6 to 8 mils.
4. Accessories:
   a. Adhesives and mechanical anchors.
   b. Protection board.

c. Crack sealers and tapes.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Install insulation and vapor barriers with continuous coverage to provide optimum performance.

SECTION 07270 - FIRESTOPPING

Summary:

1. Provide Firestopping at the Following Locations:
   a. Penetrations through fire-resistance-rated floor and roof construction.
   b. Penetrations through fire-resistance-rated walls, partitions, and structure.
   c. Sealant joints in fire-resistance-rated construction.

Submittals:

1. Submit product data, test reports, mockup of each type of joint.

Products:

1. Fire Performance: ASTM E 119, ASTM E 814, UL 1497, UL 2079 and local regulations.
2. Through-Penetration Firestop Systems where movement is less than 10%:
   a. Acrylic Latex Compounds by Hilti, Inc. CP606 Flexible Firestop Sealant
3. Fire-Resistive Elastomeric Joint Sealants where movement is from 10 to 25%:
   a. Single-component, nonsag, silicone sealant CP601S.
4. Openings between top of structural steel and metal deck.
   a. Preformed mineral wool CP 767 'Speed Strip' system by Hilti, Inc. in conjunction with CP672 'Speed Spray'

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. At openings between top of structural steel and metal deck, firestopping must be installed at fluting of decks prior to installing metal deck.
3. Inspect existing and new work for proper firestopping. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
4. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
5. Provide material thicknesses necessary to provide fire-resistance ratings indicated or required by authorities having jurisdiction.

SECTION 07410 – MANUFACTURED ROOF AND WALL PANELS

Summary:

1. Provide Exterior Insulation and Sheathing Systems:
   a. Applications over building structure

Submittals:

1. Submit product data, samples, shop drawings, 4 foot by 4 foot mockup, warranty.
2. Full shop drawings approved by engineer to be approved before fabrication.

Products:

1. Products: ThermStructure Global Corporation Steel stud with molded rigid cellular polystyrene infill.
2. Sealable joints at edges with all connecting materials and fasteners supplied.
3. Finish Coating
   a. Factory applied furring strips
   b. Factory applied continuous waterproof membrane (TOBEDETERMINED) wrapping outside and all edges of panels.
4. Accessories: 3/8" diameter double galvanized carriage bolts and nuts, 3/8" nylon washers, Loctite thread lock.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Fastening panels to structural slabs:
   a. Drill 1/2" diameter holes at preinstalled clips at floor slab edges.
   b. Set carriage bolts from outside with hammer impact.
   c. Thread nylon washer and nut from inside and tighten hand tight.
   d. Apply Loctite to prevent nut removal or turning.
3. Provide impact-resistant reinforcing at areas subject to abuse.
4. Maintain continuous membrane at envelope. Repair damage prior to siding.
5. Seal all intersections with Ice and Water Shield.

SECTION 07460 - SIDING

Summary:

1. Provide steel panels by Morin Corporation or approved equal. Install horizontally with exposed fasteners. Color to be metallic PPG XL Pewter Gray Kynar 500.

Submittals:

1. Submit product data, samples, warranty.

Products:

1. Products: siding to be 22 gauge Y-36 steel panels by Morin Corporation or approved equal. Install horizontally with exposed fasteners. Color to be metallic PPG XL Pewter Gray Kynar 500. Metal 20 gauge F-12 steel panels (NO FLUTES) by Morin or approved equal
2. Siding Auxiliary Materials:
3. Fasteners: Exposed. Color to be metallic Silversmith Kynar 500.
4. Siding Accessories:
   a. Provide cap corner, base and flashings as required of the same thickness and finish.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Coordinate siding installation with flashings to shed water properly.
3. Install work plumb, level and in proper alignment.
4. Provide work free from tool marks and blemishes.
5. Securely fasten to substrates.
6. Install in lengths to minimize joints and seams.

SECTION 07530 - SINGLE-PLY MEMBRANE ROOFING

Summary:

1. Provide single-ply membrane roofing, substrate, and roof insulation
2. Membrane Roofing Warranty: Manufacturer's 10 year warranty.

Submittals:

1. Submit product data, shop drawings, 10 year warranty, maintenance data.

Products:

1. Products:
2. Membrane Roofing: Totally adhered.
3. EPDM Membrane: EPDM, 60 mils, ASTM D 4637, Type 1.
4. Insulation: Polyisocyanurate, flat and tapered as required.
5. Substrate above metal deck: ½" thick high-density fiberboard, sealed at edges.
6. Sheet Metal Accessories: SMACNA and NRCA recommendations.
7. Walkway Protection Board: Compatible with membrane.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Coordinate membrane roofing installation with flashings and metal accessories to shed water properly.

SECTION 07600 - FLASHING AND SHEET METAL

Summary:

1. Provide Flashing and Sheet Metal:
   a. Metal counterflashing and base flashing.
   b. Exterior wall flashing and expansion joints.
   c. Exposed metal trim and fascia units.
   d. Elastic flashing.
   e. Elastic roof and wall expansion joint systems.
   f. Sheet metal accessories.

Submittals:

1. Submit product data, samples, shop drawings.

Products:

1. Sheet Metal Flashing and Trim:
   a. Step Flashing: .030 aluminum pre-finished, Kynar finish.
   b. Head Flashing: Vinyl or .030" pre-finished painted aluminum; "Z" profile. Provide at head trim over door, window and louver openings. Provide over water table. Cut slit in house wrap, to receive upper leg of flashing.
   c. Sill Flashing: Provide 2" +/- aluminum "Z" flashing under sill to allow for drip edge over exterior trim. Pre-finished .030 aluminum. Use ice and water shield to separate dissimilar metals.
   d. Fascia/Roof Edge: Minimum .032" pre-finished aluminum with continuous back flashing. Install instructions in accordance with SMACNA Guidelines. Maximum length to be 8'-0". Install continuous back flashing. Apply 6" strip of heat-welded TPO roofing under each butt joint. Leave ¼" gap between flashings. (color to match siding)
2. Fabricated Units: Compliance with SMACNA Architectural Sheet Metal Manual.
3. Elastic flashing:

a. At all envelope openings, Ice and Water Shield by WR Grace, self-adhering membrane.
b. At wall panel intersections, Ice and Water Shield, self-adhering flexible flashing by WR Grace, 6" or 9" wide for a minimum of 2" lap.

4. Auxiliary Materials:
   a. Solder compatible with metal.
   b. Bituminous isolation coating.
   c. Mastic and elastomeric sealants.
   d. Reglets and metal accessories.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Install flashing and sheet metal with provision for expansion and contraction.
3. Install flashing and sheet metal to shed water properly.
4. Isolate all dissimilar metals with bituminous coating.

SECTION 07610 - SHEET METAL ROOFING

Summary:

1. Provide Sheet Metal Roofing:
   a. Formed roof panels above balconies.

Submittals:

1. Submit product data, samples, shop drawings.

Products:

1. Steel Roof panels:
   a. Type: Aluminum coated steel sheet by Morin or approved equal.
   b. Thickness: 0.040 inches.
   c. Finish: Fluoropolymer, Kynar 500.
2. Auxiliary Materials:
   a. Rosin-sized building paper.
   b. Polyester fabric underlayment.
   c. Bituminous isolation coating.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Install sheet metal roofing with provision for expansion and contraction.
3. Install sheet metal roofing to shed water properly.
4. Isolate dissimilar metals with bituminous coating.

SECTION 07700 – ROOF SPECIALTIES AND ACCESSORIES

Summary:

1. Provide roof specialties and accessories
   a. Roof scuttle for access to roof and mechanical equipment.

Submittals:

1. Submit product data, samples, shop drawings.

Products:

1. Roof Scuttle:
   a. F-50 single leaf aluminum 4'-0 X 4'-0" by Bilco with 'posi-flash' counter-flashing system and fully enclosed curb.
   b. Standard finish

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 07762 – ROOF PAVERS AND PEDESTALS

Summary:

1. Provide concrete roof pavers and pedestals over membrane roofing at:
   a. Roof balconies.
   b. ADD ALTERNATE #1-rooftop deck

Submittals:

1. Submit product data, full color range samples, 4' x 4' mockup, shop drawings.

Products:

1. Architectural Prest Pavers by Hanover Architectural Products. www.hanoverpavers.com
   a. Size: 23 ½" X 23 ½" X 2" thick.
   b. Compressive strength: 8500 psi.
   c. Flexural strength: 1100 psi.
   d. Finish: Tudor.
   e. Color: to be determined from submitted sample colors.
2. Auxiliary Materials:
   a. Paver support pedestals and leveling plates.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Layout paving pattern from center of field, trim pavers at 2 perimeter edges.
3. Test each paver for stability, flush installation with 1/8" tolerance.

SECTION 07900 - JOINT SEALERS

Summary:

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

Submittals:

1. Submit product data, mockup of each joint type, adhesion test results for each joint type.

Products:

1. Urethane Elastomeric Joint Sealants:
   a. Nonsag Type and Application: One-part nonsag urethane sealant, ASTM C 920, for vertical and horizontal joints, exterior and interior use.
2. Silicone Elastomeric Joint Sealants:
   a. Type and Application: One-part nonacid-curing silicone sealant, ASTM C 920,

for vertical and horizontal joints, modulus as required for application, exterior and interior use.

3. Compression Seals:
   a. Type: Preformed foam tape.
   b. Application:
      1). Wide exterior joints in vertical surfaces.
      2). Sill plates in building envelope.
4. Latex Joint Sealants:
   a. Acrylic Type: Acrylic-emulsion, ASTM C 834.
   b. Application: Interior joints in vertical and overhead surfaces with limited movement.
5. Fire-Resistive Joint Sealers:
   a. Type: One part fire-stopping sealant.
   b. Application: Penetrations in fire-rated floor and wall assemblies.
6. Paving Joint Fillers:
   a. Bituminous Type: Bituminous fiber.
   b. Application: Filler for exterior paving joints.
7. Auxiliary Materials:
   a. Plastic foam joint fillers.
   b. Elastomeric tubing backer rods.
   c. Bond breaker tape.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Test sealant adhesion for each substrate required.
3. Install in proper relation with adjacent work.
4. Clean adjacent surfaces soiled with sealant immediately.

END OF DIVISION 7

# DIVISION 8 - DOORS AND WINDOWS

## SECTION 08110 - STEEL DOORS AND FRAMES

Summary:

1. Provide Steel Doors and Frames:
   a. Interior doors and frames.
   b. Exterior doors and frames.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Products: As selected by Architect complying with the following.
2. Standards: ANSI/SDI-100, Recommended Specifications for Standard Steel Doors and Frames.
3. Fire-Rated Assemblies: NFPA 80, and acceptable testing agency listing.
4. Steel Doors: Standard seamless steel doors with hollow or composite construction.
   a. Interior Doors: ANSI/SDI-100, Grade II, heavy-duty, minimum 18 gage cold-rolled steel, 1-3/4 inches thick.
   b. Exterior Doors: ANSI/SDI-100, Grade III, extra-heavy-duty, minimum 16 gage galvanized sheet steel, 1-3/4 inches thick. Minimum U-value 0.41.
   c. Accessories: Sightproof stationary louvers and glazing stops. 5/8" tempered, insulated glass lite where indicated.
   d. Finish: Factory finished.
5. Steel Frames:
   a. Interior Frames: Welded type.
   b. Material: Sheet steel, mitered or coped corners.
      1). 14 gage for frames wider than 5 feet.
      2). 16 gage.
   c. Exterior Frames: Welded type.
   d. Material: Galvanized sheet steel, mitered or coped corners.
      1). 14 gage.
   e. Accessories: Door silencers and plaster guards.
   f. Finish: Factory finished.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with SDI-100, and NFPA 80 for fire-rated assemblies.

## SECTION 08120 - ALUMINUM DOORS

Summary:

**1.** provide a pair of 2'-6" x 7'-0" in-swinging French doors (one pair per unit). Provide heavy-duty weather stripping and surface mounted dead bolts to create a DP50 infiltration rating to the interior wood doors. Utility doors to be 3'0" x 7'-0" fire rated as required. Provide master key of all locks. Provide closures and heavy duty hinges as required. Paint finish from standard range of colors or clear anodized.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Products: As selected by Architect complying with the following.
   a. Finish: AAMA 606.1 or AAMA 608.1; clear anodized.
   OR
   b. Finish: AAMA 606.1 or AAMA 608.1; factory-painted.

Installation:

1. Anchor securely in place; install plumb, level and in true alignment.
2. Coordinate with hardware and fabricate frames to receive specified hardware.
3. Coordinate with glass and glazing work.
4. After installation of doors and hardware, adjust clearances and operating parts such that parts will operate properly and not bind.

SECTION 08210 - FLUSH WOOD DOORS

Summary:

1. Provide Flush Wood Doors:
   a. Interior solid core flush doors to and within units.

Submittals:

1. Submit product data, samples, shop drawings, warranty.

Products:

1. Products:
2. Fire Rated Wood Doors: Meeting ASTM E 152 requirements.
3. Interior Solid Core Doors:
   a. Grade: Economy.
   b. Construction: 5-ply.
   c. Core: Particleboard.
   d. Finish: Opaque finish on medium density overlay faces.
4. Fitting and Finish:
   a. Fitting: Factory-prefit and premachine doors.
   b. Opaque Factory Finish: Opaque factory finish
5. Auxiliary Materials: Wood louvers

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with NWMA IS-1 and WIC Quality Standards.
3. Prefit doors to frames, premachine doors for hardware, and factory bevel.
4. Install with not more than 1/8 inch clearance at top and sides, 1/4 inch at bottom unless undercut is required.
5. Comply with NFPA 80 for rated assemblies.

SECTION 08310 - ACCESS DOORS

Summary:

1. Provide access doors for walls and ceilings.

Submittals:

1. Submit product data, sample.

Products:

1. Products: As selected by Architect complying with the following.
2. Frames: 16 gage sheet steel, with flange suitable for adjacent material.
3. Doors: 14 gage sheet steel.
4. Door Type: Flush.
5. Hinges: concealed pin, automatic spring closer.
6. Locking Devices: self-latching, operated by screwdriver.
7. Fire Rating: NFPA 80.
8. Finish for Sheet Steel Access Doors: Factory primed.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 08411 - ALUMINUM-FRAMED STOREFRONTS

Summary:

1. Provide Aluminum Entrances and Storefront:
   a. Exterior entrance doors.
   b. Frames for entrances.
   c. Storefront-type framing system.
   d. Transoms.
   e. Sidelights.

Submittals:

1. Submit product data, shop drawings.

Products:

1. Products: As selected by Architect complying with the following.
2. Door Style: Narrow stile and rail doors.
3. Storefront Frames: Thermal break type.2" X 4 ½" aluminum.
4. Aluminum Members: ASTM B 221, B 209 and B 211.
5. Steel Reinforcement: ASTM A 36, ASTM A 611, and ASTM A 570.
6. Glass and Glazing: Insulating.
7. Glass and Glazing: Tempered as required
8. Glazing Color: Clear.
9. Door Hanging Devices: Center pivot sets.
10. Closers: Concealed
11. Closer Operation: Single acting closers.
12. Hardware: Push/pulls, door stops, overhead holders, and deadlocks, weatherstripping and thresholds, exit devices.
13. Aluminum Finish: Clear anodized. OR standard color range fluoropolymer.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Anchor securely in place; install plumb, level and in true alignment.
3. Isolate dissimilar metals.
4. Coordinate with glazing work and hardware requirements.

SECTION 08520 - ALUMINUM WINDOWS

Summary:

1. Provide aluminum windows.

Submittals:

1. Submit product data, samples, shop drawings, mockup, test reports, warranty, maintenance data.

Products:

1. Products: Traco, Efco, Peerless or approved equal.
2. Aluminum Windows:
   a. Window Operation: Double hung.
   b. Window Operation: Fixed.
   c. Window Grade, AAMA 101: Commercial grade,
   d. Glazing: Insulating glass:
      1). 1 inch thick, gas-filled with Low E coating.
   e. Glazing Color: Clear.
   f. Construction: Thermal-break type.
   g. Aluminum Window Members: Aluminum extrusions.
   h. Anchors, Clips, and Window Accessories: Aluminum, nonmagnetic stainless steel, or galvanized steel.
   i. Aluminum Finish: Fluoropolymer.
3. Auxiliary Materials:
   a. Operating hardware,sash lifts, ; provide fixed glazing except where operation symbols are shown on elevations

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 08710 - DOOR HARDWARE

Summary:

1. Provide hardware for swinging doors.
2. Comply with code and accessibility requirements.

Submittals:

1. Submit product data, samples, proposed hardware schedule, maintenance data.

Products: As selected by Architect complying with the following.

1. Product Requirements:
   a. Hardware for Fire-Rated Openings: NFPA 80, and local requirements.
   b. Handicapped Accessibility: ANSI A117.1, ADAAG, and local requirements.
   c. Materials and Application: ANSI A156 series standards.
   d. Quality Level: Commercial.
2. Locksets and Latchsets: Mortise type. Mode Lever, Satin Nickel finish with 2 3/8" backset by Emtek. Passage, Privacy or Dummy sets as listed in Door Schedule.
3. Closet doors to have dummy knobs and ball catches only.
4. Lock Cylinders: Integral type.

5. Keying: Owner's requirements.
6. Hinges and Butts: Full-mortise type with nonremovable pins at exterior , entrance and security doors.
7. Closers: Low frequency.Sargent 1430 or equal.
8. Closers: Barrier-free type.
9. Exit Devices: Low frequency.
10. Pivots: Offset or center-hung type.
11. Push/Pull Units: Through-bolted type.
12. Hardware Finishes: Satin stainless finish or Satin Nickel on exposed surfaces.
13. Silencers.
14. Weatherstripping
15. Thresholds.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with DHI "Recommended Locations for Builder's Hardware" and hardware manufacturers instructions.
3. Refer to the door schedule for hardware sets.

SECTION 08720 - POWER DOOR OPERATORS

Summary:

1. Provide door operators for power-assisted doors at main entrance.

Submittals:

1. Submit product data, hardware schedule, maintenance data.

Products:

1. Products: As selected by Architect complying with the following.
2. Power Units: One-way swing.
3. Operator: Electromechanical operator.
4. Manual Door Control: Rail-supported switch.
5. Auxiliary Materials: Guide rails, wall push-plate switch.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

END OF DIVISION 8

# DIVISION 9 - FINISHES

## SECTION 09260 - GYPSUM BOARD ASSEMBLIES

Summary:

1. Provide Gypsum Board Assemblies:
   a. Interior walls, partitions, soffits, and ceilings for tape and joint compound finish.
   b. Insulation and vapor barrier systems in gypsum drywall systems.
2. Gypsum Board Attachment:
   a. Gypsum board screw-attached to steel framing and furring.
   b. Gypsum board wire attached to fire-protected framing.

Submittals:

1. Submit product data, 4 foot by 4 foot mockup showing joint treatment.

Products:

1. Products: As selected by Architect complying with the following.
2. Gypsum Board:
   a. Gypsum Wallboard: ASTM C 36, regular, foil-backed, and fire-rated types:
      1). 5/8 inch typical thickness.
   b. Water-Resistant Gypsum Backing Board: ASTM C 630, regular and fire-rated types, at all bathroom walls and behind kitchen counters.
      1). 5/8 inch typical thickness.
   c. Exterior Gypsum Soffit Board: ASTM C 931, regular and fire-rated types:
      1). 5/8 inch typical thickness.
   d. Joint Treatment: ASTM C 475 and ASTM C 840, 3-coat system.
   e. Installation Standard: ASTM C 840.
3. Trim Accessories by Beadex:
   a. Types: Cornerbead, edge trim, and control joints.
      1). 90 degree outside corners: B:1-W
      2). 90 degree inside corners: B-2.
      3). Non-90 degree corners: B-1 Flex-Bead.
   b. Decorative Profiles: Aluminum reveals and channels.
4. Steel Framing for Walls and Partitions:
   a. Steel Studs and Runners: ASTM C 645: ASTM A653, G60 hot-dipped galvanized. Provide slip track at all partitions.
      1). 20 gage (.0329 inch)
   b. Depths:
      1). 3-5/8 inch
      2). 6 inch.
   c. Furring Channels: ASTM C 645:
      1). 20 gage (.0329 inch)
   d. Auxiliary Framing Components: Furring brackets, resilient furring channels, Z-furring members, and non-corrosive fasteners.
   e. Installation Standard: ASTM C 754.
   f. Steel Studs: Match steel studs used for walls.
   g. Accessories: Hangers and inserts.
   h. Installation Standard: ASTM C 754.
5. Auxiliary Materials:
   a. Gypsum board screws, ASTM C 1002.
   b. Fastening adhesive.
   c. Concealed acoustical sealant.

d. Mineral fiber sound attenuation blankets.
e. Mineral fiber thermal insulation.
f. Polyethylene vapor retarder, 6 mils.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with standards referenced above and ASTM C 840 and GA 216.
3. Install joints only over framing members. Do not allow butt-to-butt joints.
4. Blocking for items such as railings, grab bars, casework, toilet accessories, and similar items – refer to Division 6.
5. Provide acoustical sealant at runner tracks, wall perimeters, openings, expansion, and control joints.
6. Install gypsum board assemblies true, plumb, level and in proper relation to adjacent surfaces.
7. Provide 3-coat joint treatment such that, after finishing, joints are not visible.

SECTION 09263 - GYPSUM BOARD SHAFT-WALL ASSEMBLIES

Summary:

1. Provide gypsum board shaft-wall assemblies.

Submittals:

1. Submit product data.

Products:

1. Products: As selected by Architect complying with the following.
2. Cavity Shaft Wall Assemblies:
   a. Shaftwall Board Thickness: Not less than 1 inch.
   b. Studs: I, C-H or double E studs, not less than:
      1). 22 gage (.0276 inch)
3. Gypsum Board Shaft Wall Materials:
   a. Steel Framing: ASTM C 645.
   b. Gypsum Shaftwall Board: ASTM C 442, Type X.
   c. Gypsum Wallboard: ASTM C 36, Type X.
   d. Gypsum Wallboard Joint Treatment Materials: ASTM C 475 and ASTM C 840.
4. Auxiliary Materials:
   a. Cornerbeads, edge trim, and control joints.
   b. Laminating adhesive.
   c. Gypsum board screws, ASTM C 1002.
   d. Concealed acoustical sealant.
   e. Mineral fiber sound attenuation blankets.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 09910 - PAINTING

Summary:

1. Provide painting and surface preparation for interior and exterior unfinished

surfaces as scheduled.
2. Provide painting and surface preparation of exposed mechanical and electrical piping, conduit, ductwork, and equipment.
3. Provide painting of entire surface where patch painting is required.

Submittals:

1. Submit product data, samples, 4 foot by 4 foot mockup of each color, extra stock consisting of 1 unopened gallon of each type of paint used.

Products:

1. Products: Benjamin Moore & Company 'superspec' series.
2. Regulations: Compliance with VOC and environmental regulations.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Provide field-applied mock-ups of each color and finish selected on actual surfaces to be painted.
3. Test sample area for adhesion for each type of paint.
4. Remove cover plates and protect hardware and adjacent surfaces.
5. Sand before painting until smooth and flat and sand between coats.
6. Apply paint to achieve manufacturer's recommended dry film thicknesses.
7. Paint entire surface where patch painting is required.
8. Recoat areas which show bleed-through or defects.
9. Clean paint spatter from adjacent surfaces and glass.
10. Touch-up damaged surfaces at completion of construction.

Schedule:

1. Provide paint systems complying with the following schedule.
2. Gypsum Drywall Walls:
    1). Primer coat compatible with finish coats.
    2). Final coats: 2 coats Moorcraft #274 Super Spec Latex Eggshell Enamel.
3. Gypsum Drywall Walls and Ceilings in Bathrooms, Kitchens and Wet Areas:
    1). Primer coat compatible with finish coats.
    2). Final coats: 2 coats Moorcraft #274 Super Spec Latex Satin Enamel.
4. Gypsum Drywall Ceilings:
    1). Primer coat compatible with finish coats.
    2). Final coat: 1 coat Moorcraft #274 Super Spec Latex Flat Enamel.
5. Wood for Painted Finish:
    a. Gloss:
        1). Semi
    b. System:
        1). 1 coat interior alkyd enamel undercoat
        2). 1 coat alkyd enamel
6. Wood for Transparent Finish:
    a. Gloss:
        1). Satin
    b. System:
        1). 1 coat water base sealer
        2). 2 coats water base varnish
7. Ferrous Metals:
    a. Gloss:
        1). Semi
    b. System:
        1). 1 coat rust-inhibiting primer

2). 1 coat alkyd enamel

END OF DIVISION 9

# DIVISION 10 - SPECIALTIES

## SECTION10200 - LOUVERS AND VENTS

Summary:

1. Provide fixed metal wall louvers.
2. Provide wall vents.
3. Provide dryer vents.
4. Provide chase vents at roof (REFER TO DIV 15)

Submittals:

1. Submit for approval: product data, shop drawings, maintenance data.

Products:

1.Manufacturer: Industrial Louvers Inc. (ILI). (763) 972-2981

2. Storm performance Louvers

ILI 7" (127.0 mm) Architectural Line, Sight Proof Model SP-537

1. Frame and front blade thickness to be .081" (2.05 mm) extruded aluminum 6063-T6 alloy. The back blade are .063" (1.60 mm) extruded aluminum. The back frame shall be designed to collect and drain water to exterior at sill by means of channels in the jambs. Back blades are attached by means of mechanically fastened assembly. Front blades are attached by means of field installing into interlocking blade braces. Louver to be supplied with 4" (101.6 mm) high sill pans with welded end dams.

A. Louver accessories
   a. Blank-off panels:Panels to be insulated with 2" thick rigid insulation. Insulation to be faced on both sides with .032" (0.81 m) thick aluminum sheet. Perimeter panel frame to be formed from .050" (1.27 mm) thick formed aluminum channels, mitered at corners.

   b. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or galvanized steel.

B. Aluminum Finish: Clear anodized or fluoropolymer.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

## SECTION10260 WALL AND CORNERGUARDS

Summary:

1. Provide cornerguards at GWB corners, first floor.

Submittals:

1. Submit product data, sample, shop drawings, maintenance data.

Products:

1. Products: As selected by Architect complying with the following.
2. Cornerguards
   a. Aluminum Extrusions 90 degree with each face 2", self-stick adhesive
   b. Finish: submit standard color range for approval.

Installation:

Comply with requirements of Section 01000 - Project Requirements

SECTION 10416 - DIRECTORIES AND BULLETIN BOARDS

Summary:

1. Provide building directories.

Submittals:

1. Submit product data, samples, shop drawings.

Products:

1. Products: As selected by Architect complying with the following.
2. Directories:
   a. Type: Non-illuminated.
   b. Frame: Reveal-type.
   c. Glazing: Clear glass
   d. Message Strips: Engraved-type.
   e. Design and construction suitable for exterior exposure.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Coordinate with building intercom entry system.

SECTION 10425 - SIGNS

Summary:

1. Provide building signage to comply with code and accessibility regulations.
2. Provide building identification in size, style, and layout as shown on drawings.

Submittals:

1. Submit product data, samples.

Products:

1. Products: As selected by Architect complying with the following.
2. Panel Signs:
   a. Type: Unframed type.
   b. Material: Aluminum.
   c. Copy: Printed lettering.
   d. Anti-graffitti coating.
3. Dimensional Letters and Numbers:
   a. Type: Fabricated
   b. Material: Aluminum.
4. Metal Finishes:
   a. Aluminum: Clear anodized finish.
5. Accessories:
   a. Non-corrosive anchors to masonry and/or metal panel.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

2. Install with tamper-proof fasteners.

SECTION 10522 - FIRE EXTINGUISHERS AND CABINETS

Summary:

1. Provide fire extinguishers and cabinets
   a. Fire extinguishers.
   b. Fire extinguisher cabinets.

Submittals:

1. Submit product data including handles and text layout.

Products:

1. Products: As selected by Architect complying with the following.
2. Standards: UL and FM listed products.
3. Fire Extinguishers:
   a. Type: As required by applicable authority.
   b. Rating: Sized for project requirements.
   c. Public Area Mounting: Cabinet mounted.
   d. Service Area Mounting: Metal brackets.
4. Cabinets:
   a. Mounting: Surface-mounted.
   b. Trim: Exposed.
   c. Doors: Aluminum, clear or color anodized .
   d. Door Style: Solid panel.
   e. Accessories: fire handle.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

SECTION 10550 – POSTAL ACCESSORIES

Summary:

1. Provide Mail collection unit compliant with U. S. Postal Service.

Submittals:

1. Submit product data and shop drawings.

Products:

1. Products: As selected by Architect complying with the following.
2. Boxes to be 15" high X 5" wide X 6" deep.
3. Vertical semi-recessed aluminum.
4. Rear-loaded from Mailroom.
5. Disc wafer flat keying.
6. Finish: clear anodized or fluoropolymer.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Comply with ADA requirements.

SECTION 10800 - TOILET AND BATH ACCESSORIES

Summary:

1. Provide toilet and bath accessories.

Submittals:

1. Submit product data, samples.

Products

1. Products: Toilet and Bath Accessories:
   a. Toilet tissue dispensers, single roll. Furnish stainless steel LILLHOLMEN toilet roll holder by IKEA
   b. Grab bars.
   c. Shower curtain rods
   d. Towel bars. Furnish stainless steel LILLHOLMEN towel rail, 29 7/8" by IKEA.
   e. Folding shower seats where required.
   f. Medicine cabinets. Furnish Surface mounted RACKEN mirror cabinet 24 3/8 X 6 3/4 X 26" H by IKEA
   g. Mop and broom holders.
2. Materials and Finishes:
   a. Stainless Steel: AISI Type 302 or 304, polished or brushed finish.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

END OF DIVISION 10

# DIVISION 11 - EQUIPMENT

## SECTION 11452 - APPLIANCES

Summary:

1. Provide kitchen area appliances.
   a. Ranges
   b. Range hoods/microwaves.
   c. Refrigerators
   d. Dishwashers.
   e. Waste disposers.
2. Provide laundry area appliances.
   a. Washing machines.with stacked electric dryers.
   b. Dryer vents.

Submittals:

1. Submit product data, bound instruction manuals for each unit, warranty, maintenance data.

Products:

1. Kitchen appliances.

| | | | | |
|---|---|---|---|---|
| Refrigerator | Amana | Topfreezer, 21 cu, ft, | White | ATB2132AR |
| Range | Amana | 4 sealed gas burners | White | AGR4412ADW |
| Microwave/hood | Amana | 1000 watt, 1.5 cu. Ft. | White | AMV1162AAW |
| Dishwasher | Amana | 24 inch undercounter | White | ADB1500AWW |
| Waste Disposer | | ¾ HP Stnls Stl grinder | - | Sound insulation |
| | | | | |

2. Laundry appliances
   a. Stackable washer-dryers with venting to exterior. 28" maximum wide and deep.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Test appliances.

END OF DIVISION 11

# DIVISION 12 - FURNISHINGS

## SECTION 12372 - KITCHEN AND BATH CASEWORK

Summary:

1. Provide prefabricated modular kitchen casework.
2. Provide prefabricated modular bath medicine cabinets.

Submittals:

1. Submit product data, samples, shop drawings, cabinet and counter mockup, maintenance data.

Products:

1. Products: IKEA Akurum series wall, base, and sink base cabinets in sizes indicated on drawings, white color panels and frames. .
2. Casework:
   a. Materials: Melamine on composite board
      1). Drawer boxes and slides: steel.
   b. Face Style: Full overlay.
   c. Applied Finish: Opaque, factory applied.
3. Counter Materials: Plastic laminate, GP 50 thickness with particleboard substrate. IKEA – Pragel Countertop, stone effect black color with matching backsplash.
4. Accessories: matching basecabinet legs, kick, backsplash as required.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Install in proper relation with adjacent work using concealed shims. Scribe and cut to fit.
3. Test and adjust door and drawer operation.

## SECTION 12690 - FLOOR MATS AND FRAMES

Summary:

1. Provide floor mats and frames in size and location as shown on drawings.

Submittals:

1. Submit product data, samples.

Products:

1. Products: Framed Tread Mats: Aluminum construction 12" X 12" X 3/8" tiles as insert-ROP-CORD by Roppe, Inc.
2. Mounting: Recessed in metal frame
3. Extruded Aluminum Frame: Clear anodized finish.
4. Tread insert: recycled rubber tires vulcanized to rubber backing.
5. Color: Earthtone
6. Fasteners: non-corrosove screws and anchors.

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.
2. Install product when no further wheeled construction traffic will occur and wet type operations including painting and decorating are complete.

SECTION 12900 - BUILDING ACCESSORIES

Summary:

1. Provide building accessories:
   a. Ash/trash receptacles.

Submittals:

1. Submit product data, samples.

Products:

1. Products:

Installation:

1. Comply with requirements of Section 01000 - Project Requirements.

END OF DIVISION 12

# DIVISION 14 - CONVEYING SYSTEMS

## SECTION 14212
## ELECTRIC TRACTION MACHINE ROOM ELEVATORS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Machine room electric traction passenger elevators as shown and specified. Elevator work includes:
   1. Commercial, geared/gearless electric traction passenger elevators.
   2. Elevator car enclosures, hoistway entrances and signal equipment.
   3. Operation and control systems.
   4. Accessibility provisions for physically disabled persons.
   5. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
   6. Materials and accessories as required to complete the elevator installation.

B. Related Sections:
   1. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
   2. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
   3. Division 5 Metals:
      a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
      b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
   4. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
   5. Division 16 Sections:
      a. Providing electrical service to elevators, including fused disconnect switches.
      b. Emergency power supply, transfer switch and auxiliary contacts.
      c. Heat and smoke sensing devices.
      d. Convenience outlets and illumination in machine room, hoistway and pit.
   6. Division 22 Plumbing:
      a. Sump pit
   7. Division 23 Heating, Ventilation and Air Conditioning:
      a. Heating and ventilating hoistways and machine rooms.

### 1.02 SUBMITTALS

A. Product data: When requested, submit product data for the following:
   1. Elevator car enclosures and hoistway entrances.
   2 Operation, control, and signal systems.

B. Shop drawings:
   1. Show equipment arrangement in the machine room, corridor, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
   2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
   3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
   4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Color selection: Submit color charts of exposed finishes and materials for color selection.

1. When requested, submit samples of exposed finishes and materials selected for the elevator system materials and components.

D. Certificates: Inspection and acceptance certificates of elevator system installation.

E. Operation and maintenance data. Include the following:
1. Operation and maintenance instructions.
2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: An approved manufacturer regularly engaged in manufacturing, installing, and servicing elevators of the type required for the project.
1.
The major parts of the elevator equipment shall be manufactured in the United States.

B. Installer Qualifications: Not less than five years of satisfactory experience installing elevators equal in character and performance to the project elevators.

C. Regulatory Requirements:
1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
2. NFPA 70 National Electrical Code.
3. NFPA 80 Fire Doors and Windows.
4. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
5. Section 407 in ICC A117.1, as required by local authorities

D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).

E. Inspection and testing:
1. Elevator Installer shall obtain and pay for all required state inspections, tests, permits and fees for elevator installation.
2. Arrange for state inspections and make required state tests.
3. Deliver to the Owner upon completion and acceptance of elevator work.
4. All costs for other trades required during testing will be the responsibility of GC

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver elevator materials, components and equipment in manufacturer's protective packaging.

B. Store materials in a dry protected area provided by others. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.05 PROJECT CONDITIONS

A. Temporary Use:
1. Provide all necessary protection to prevent damage to each elevator used for construction purposes before Substantial Completion.
2. Provide temporary enclosures, coverings, guards, barriers and other devices required to protect the elevator car enclosures, hoistway entrances, signal fixtures and related materials,

components and finishes from damage. Protective materials, methods and procedures shall be approved by the elevator manufacturer and paid for by the user.

3. Maintenance during use, including cleaning, lubricating and adjusting equipment and components for proper elevator operation shall be performed only by the elevator manufacturer. Cost for maintenance shall be paid by the user.
4. Elevators shall be free of damage or deterioration at time of Substantial Completion. Cost to repair damaged materials and finishes and replace worn or defective components to restore elevators to their original condition shall be paid by the user.

B. Painting:
1. Except as otherwise specified, paint all metal work provided by the elevator manufacturer and installer.
2. Provide all ferrous metals installed in the hoistway shop primed with a rust inhibitive primer.

1.06 WARRANTY

Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months from date of Substantial Completion.

1.07 MAINTENANCE

A. Furnish maintenance and call back service for a period of 12 months for each elevator from date of Substantial Completion.
1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours."
2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
3. Installer shall have a service office and full time service personnel within a 50 mile radius of the project site.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
1. Kone
2. Schindler
3. Virginia, GAL, Hollister Whitney

2.02 MATERIALS, GENERAL

A. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.

B. Steel:
1. Shapes and bars: Carbon.
2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
3. Finish: Factory-applied baked enamel.

C. Stainless steel:
1. Shapes and bars: No. 4 brushed or No. 8 polished stainless.

2. Tubing: No. 4 brushed or No. 8 polished stainless.

D Aluminum:
1. Sheet and plate: Commercial quality.
2. Extrusions: Commercial quality.

E Plastic laminate: Decorative high-pressure type, complying with NEMA LD3,

2.03 HOISTWAY EQUIPMENT

A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed.

B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.

C. Guide Rails: Dry, non-lubricated steel, fastened to the building with steel brackets.

D. Guides: Roller guides, with a minimum of three tires, shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.

E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.

F. Machine: The hoisting machine shall be a geared traction type, consisting of AC motor, brake and driving sheave mounted on a rigid bedplate. A large diameter, forged shaft shall serve as a support for the motor armature and for the removable drive sheave and brake drum/disc. It shall be supported by roller bearings.
1. Steel deflector sheaves of adequate diameter and strength shall be provided as necessary.

G. Drive System:
1. The drive system shall be of the nonregenerative Variable Voltage Variable Frequency (VVVF) type.
2. The system shall be a vector controlled pulse-width modulated AC drive. The variable voltage variable frequency drive shall convert the AC power supply using a two step process to a variable voltage variable frequency power supply for use by the hoist motor.
3. The speed control shall be by means of vector control providing independent excitation and torque current. A digital absolute velocity encoder shall be provided giving feedback to the controller on armature position and motor speed.

H. Motor/Machine: The motor shall be AC, with class "F" insulation. The motor armature shall be dynamically balanced and supported by roller bearings of ample capacity. The armature and driving sheave shall be properly balanced for smooth, high-speed elevator performance.

The Machine shall be mounted in a machine room directly over the elevator on structural steel beams or channels and bearing plates furnished by the elevator installer. Beams shall be securely fastened to the supports supplied by other trades.

I. Brake:

The brake shall be a spring applied electric brake; held open by an electro-magnet actuated by a digital brake controller and designed to work as an integral part of the motor controller to provide smooth positive stops. The Brake shall be designed to automatically apply in the event of interruption of power supply from any cause. Operation and control of the brake shall be all digital. The setting and lifting of the brake shall be software based and all

electronic. All adjustments and setup of the brake shall be made using a PC interface. No contactors or resistors shall be use in the actuation of the brake.

J. Ropes:

Steel hoist ropes of size and number to ensure proper wear qualities shall be used. Wedge shackles designed for use with steel ropes shall be used.

Furnish adequate compensation for weight of hoist ropes when required to maintain proper counterbalance ratio.

Governor rope shall be 3/8" steel.

K. Counterweight:

Counterbalance each elevator for smooth and economical operation by using iron or steel plate weights securely fastened in a steel counterweight frame. Counterweight shall equal the weight of the complete elevator car and approximately 40-45 percent of the specified capacity load.

L. Safety and Governor:

Car safety shall be mounted on the bottom members of the car frame and be operated by a centrifugal speed governor. The governor shall be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. The governor shall function when the car over speeds in either the up or down direction. The governor will be mounted above the car.

M. Emergency Terminal Limits:

Place electric limit switches in the hoistway near the terminal landings. Limit switches shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.

N. Automatic Self-Leveling:

Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.

2.04 HOISTWAY ENTRANCES

A. Doors and Frames:

1. Provide complete hollow metal type hoistway entrances at each hoistway opening.
2. Select from manufacturer's standard entrance design consisting of 14 gauge frames with 2 inch profile, 18 gauge doors, hangers, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.
3. Provide information for wall interface with hoistway entrance assembly.
4. Doors shall be of the flush construction type:
   a. Main landing: ASTM A 366 steel panels, factory-applied baked enamel finish.
   b. Typical landings: ASTM A 366 steel panels, factory-applied baked enamel finish.
5. Frames shall be of the formed construction type:
   a. Main landing: Cold-rolled sheet steel with factory-applied baked enamel finish.
   b. Typical landings: Cold-rolled sheet steel with factory-applied baked enamel finish.

B. Interlocks: Equip each hoistway entrance with an approved type interlock, tested as required by code. Interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at that landing or is in the leveling zone and stopping at that landing.

C. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway sliding door.
   1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
   2. Hangers: Provide an adjustable up-thrust device on each door hanger roller.
   3. Tracks: Provide integral or drawn steel shapes, smooth surface and shaped to conform to the hanger rollers.

D. Hoistway Sills: Extruded metal, with grooves in top surface. Provide mill finish on aluminum at main landing and at typical landings.

2.05 PASSENGER ELEVATOR CAR ENCLOSURE

A. Car Enclosure:
   1. Walls: durable wood core finished with high pressure plastic laminate.
   2. Canopy: Reinforced 14 gauge cold-rolled steel with hinged exit. Finish: Two coats factory applied reflective baked enamel.
   3. Ceiling: Suspended type, fluorescent lighting with translucent diffuser mounted in a metal frame.
      a. Frame finish: Factory-applied baked enamel finish. Color selected from manufacturer's standard selection chart.
      b. Panel finish: Not Applicable
   4. Cab Columns, Front, and Transom: Provide panels faced with brushed stainless steel.
   5. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
      a. Door Finish: Stainless steel panels: No. 4 brushed finish.
      b. Cab Sills: Extruded aluminum, mill finish.
   6. Handrail: Provide 2" flat metal bar on rear wall. Handrails shall have a stainless steel, no. 4 brushed finish.
   7. Ventilation: Provide single speed exhaust fan mounted on the car top.
   8. Pad Buttons: Provide one set of vinyl protection pads with metal grommets for the project. Provide pad buttons on cab front(s) and walls.
   9. Finished Floor: Finished flooring to be provided by others, with a maximum thickness of 3/8".

B. Car Top Inspection: Provide a car top inspection station with an "Emergency Stop" and Inspection/Automatic switch and constant pressure "safe", "up" and "down" direction buttons. The Inspection switch shall make the normal operating devices inoperative when in the Inspection position and give the operator complete control of the elevator. Mount the car top inspection station in the door operator assembly.

2.06 DOOR OPERATION

A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
   1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.

2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is prevented for a field programmable time, a buzzer will sound. When the obstruction is removed, the door will begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors will stop and resume closing only after the obstruction has been removed.
5. Limited Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then attempt to open six times to try and correct the fault.
7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then attempt to close six times to try and correct the fault.
8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.

B. Door Protection Device: Provide a door protection system using 150 or more microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen. A mechanical reopening device shall not be acceptable.

## 2.07 CAR OPERATING STATION

A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Swing return shall have a brushed stainless steel finish. The panel shall consist of the following pushbuttons, key switches and indicators:
1. The bottom of the Car Operating Station shall contain the "door open," "door close," "alarm" buttons and a keyed "emergency stop" switch.
2. The Intermediate area of the station shall contain floor buttons which illuminate when a call is registered and remain illuminated until the call is answered. Raised floor indications and handicap symbols shall be located to the left and immediately adjacent to the floor buttons. No applied symbols or floor indications or symbols on the buttons shall be permitted.
3. The next level shall contain supplied options switches.
4. The top of the Car Operating Station shall contain fire service features, including operating instructions, in accordance with ASME A17.1 and any local code.

B. Position Indicator: A position indicator shall be contained above floor push buttons. As the car travels, its position in the hoistway shall be indicated by the illumination of the alpha/numeric character corresponding to the landing which the elevator is stopped at or passing.

C. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.

E. Emergency Light: An emergency light and capacity plate shall be provided. The Emergency Light shall illuminate automatically upon loss of the building's normal power supply. The light shall meet the illumination requirements of the A-17.1 and/or local code requirements.

F. Communications: Provide an emergency communications device mounted integrally within the swing return. Emergency communications device shall comply with Americans with Disabilities Act (ADAAG) requirements.

G. Auxiliary Operating Panel: Not Required

H. Include the following special controls:
1. Independent service switch.
2. Inspection switch.
3. Fan/light switch.
4. Certificate frame.

2.08 CONTROL SYSTEMS

A. Controller: The elevator control system shall be microprocessor based and software oriented. The system shall operate in real time, continuously analyzing the car(s) changing position, condition, and work load. All controller and operational circuits including the brake control and drive system shall be digital. Control of the elevator shall be automatic in operation by means of push buttons in the car operating panel numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings
1. Momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.
2. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.
3. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor, only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.
4. A car that is stopping for the last hall call in the preference direction and that hall call is for the opposite direction with no onward car calls, shall reverse preference when the selector position advances to the landing at which the car is committed to stop. A car that is stopping for the last hall call in the preference direction, and that hall call is for the same direction, shall hold its preference until the door is almost closed allowing time for a passenger to register an onward car call which will maintain the preference. If no car call is registered before the door is almost closed, the car will lose its preference and shall be available to accept calls in either direction.]
5. Controller will have built in diagnostics. All tools required for maintenance or service will be provided to the owner and will become the owners property. No proprietary equipment will be accepted.

B. Operation: Selective Collective - ETA based. The system is optimized to get a car to the floor where a hall call has been registered, in the shortest time. The system receives input information

from standard call pushbuttons located in the hall, car position and car load information from individual car loadweighers.

Where group operation is required, **the group supervisory operation shall be embedded within** selected car controllers. **No separate group** controller shall be supplied. **The microprocessor shall constantly scan the system for hall calls. When hall calls are registered, the control system shall immediately calculate the estimated time of arrival using such information as, number of floors to travel from the current position, the time it takes to travel one floor at top speed, calls assigned to a car, and car reversal time to respond to a call in the opposite direction of travel. When a car's status changes or additional hall calls are registered, the estimated time of arrival shall be recalculated and calls reassigned if necessary.**

1. **Traffic Pattern: The microprocessor shall provide flexibility to meet well defined patterns of traffic, including up peak, down peak, and heavy interfloor demands, and adjust for indeterminate variations in these patterns which occur in buildings.**
2. **Fuzzy logic: Fuzzy logic shall be an integral part of the group control system software. The enhanced fuzzy logic will optimize the interfloor traffic performance. Inputs for the fuzzy logic shall include accurate passenger load from an electronic loadweigher, probable car calls generated from each hall call, type of building and observed traffic patterns.]**

C. Anti-Nuisance Call Control: The microprocessor control system shall evaluate the number of people on the car and compare that value to the number of car calls registered. If the number of car calls exceeds the number of people by a field programmable value, the car calls shall be canceled after the first call has been answered.

D. Position Selector: The position selector shall be part of the microprocessor system. The car position in the hoistway shall be digitized through a primary position encoder. The microprocessor control system shall store the floor position and slow down points in memory.

E. Motion Control: The drive control system shall be dual-loop feedback system based primarily on car position. The velocity profile shall be calculated by the microprocessor control system producing extremely smooth and accurate stops. The velocity encoder shall permit continuous comparison of machine speed to velocity profile and to actual car speed. This accurate position/velocity feedback shall permit a fast and accurate control of acceleration and retardation.`

G. Motor Pre-Torque: Current shall be applied to the elevator drive before the brake is released and the speed pattern is dictated to eliminate roll back and sling shot effects of unbalanced loads in the car. The electronic loadweigher shall determine the load on the car which will be used in determining a pre-torque reference to send to the drive.

## 2.09 HALL STATIONS

A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.

Provide one set of pushbutton risers with faceplates having a brushed stainless steel finish.

1. Each terminal station shall contain one illuminating push button.
2. Each intermediate station shall consist of two illuminating pushbuttons, one for the up direction and one for the down position.
3. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.

B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements and, when required by local code: Section 407 in ICC A117.1.

C. Hall Position Indicator: An electronic dot matrix position indicator shall be provided and mounted for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alphanumeric character corresponding to the landing which the elevator is stopped or passing. When hall lanterns are provided, the position indicator shall be combined with the hall lanterns in the same faceplate. Faceplates shall match hall stations. Provide at main landing only.

D. Hall lanterns: Not required for this application.

**PART 3 EXECUTION**

3.01 EXAMINATION

A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and machine rooms, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install elevator systems components and coordinate installation of hoistway wall construction.
1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
2. Comply with the National Electrical Code for electrical work required during installation.

B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.

C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.

D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.

E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.

F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.

G. Sound isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent the transmission of vibrations to the structure, and eliminate sources of structure-borne noise from the elevator system.

H. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.

I. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.

J. Lubricate operating parts of system, including ropes, as recommended by the manufacturer.

3.03 FIELD QUALITY CONTROL

A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; shall not be cleaned with bleach-based cleansers.

B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.06 PROTECTION

At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

Elevator Qty.: 1

1. Overhead traction
2. Elevator Type: Passenger, Traction geared
3. Rated Capacity: 2500 lbs.
4. Rated Speed: 250 ft/min.
5. Drive: VVVF
6. Travel: 74'-4"
7. Landings: 7 total
8. Openings:
   a. Front: 8
9. Clear Car Inside: 6' - 8" wide x 4' - 3" high
10. Cab Height: 8'-0" nominal
11. Hoistway Entrance Size: 3' - 6" wide x 7'-0 high
12. Door Type: Single Speed
13. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
14. Seismic Requirements: Zone 2

END OF DIVISION 14

# DIVISION 15 - MECHANICAL

## SECTION 15100 - MECHANICAL GENERAL REQUIREMENTS

### 1.01 DESCRIPTION OF WORK

A. Summary of Work

1. Furnish labor, materials, equipment, transportation and perform operations required to install a complete hot water heating and ventilation system in the buildings; together with plumbing systems in accordance with these specifications and drawings.

2. Work to be performed shall include, but is not limited to the following:

   a. Hot water heating, ventilating and plumbing systems
   b. Pipe, valve and fittings
   c. Hot water specialties
   d. Circulating pumps
   e. Baseboard radiation
   f. Insulation
   g. Sheet metal including ducts fans and louvers
   h. Natural gas piping system
   i. Temperature control, tests and balance
   j. Sprinkler System
   k. Fire and smoke sealing of all Division 15 pipe and duct penetrations of walls, partitions and floors.

3. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, duct work and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.

B. Mechanical Electrical Work

1. Furnish motors, temperature controls switches provided or installed by equipment manufacturer as a component part of heating and plumbing equipment. Other switches, fused switches, outlets, motor starters and fuses not furnished as component part by equipment manufacturer shall be furnish and installed by a licensed electrician.

2. All 24 volt electric wiring for temperature control system shall be furnished and installed by Temperature Control Contractor and installed in accordance with National, state and local electrical codes.

3. All 24 volt electric wiring for temperature control system shall be furnished and Installed by Temperature Control Contractor and installed in accordance with National, state and local electrical codes.

4. Wall Hung Hot Water Boilers: Electrical Contractor shall provide power wiring and disconnect switch to variable frequency drive (VFD) for each pump and wire between VFD and motor for each pump disconnect switch.

5. Natural Gas Burners: Electrical Contractor shall furnish circuit breakers for wiring to control panels by Gas Burner Contractors.

6. Temperature Control Panel: Electrical Contractor shall run 120 volt circuit to temperature control panel and provide duplex receptacle on or adjacent to panel.

7. Fans: Fans shall be wired and provided with disconnect switches with overload protector, or disconnect switches with magnetic starters by Electrical Contractor as follows:

    a. Bathroom Exhaust Fans EF-1
    b. Kitchen Exhaust Fans EF-2
    c. Plumbing Air Shaft Exhaust Fans EF-3 thru EF-8
    d. HV Air Shaft Exhaust Fans EF-9 thru EF-13
    e. Corridor Exhaust Fans EF-14 and EF-15

8. Kitchen Re-circulating Range Hoods

    Electrical Contractor shall provide power wiring for hood re-circulating exhaust fan and light. Provide remote wall switch for separate fan and light in ADA apartments.

9. Hot Water Baseboard 2-Way Control Valves: Mechanical Contractor shall wire control of control valves and room thermostats.

10. Cabinet Unit Heater CUH-1, CUH-2 and Wall Heaters WH-1, WH-2: Electrical Contractor shall provide 0.5 AMP, 120/60/1 power for unit fan.

11. Gas Fired Unit Heater GFUH-1: Electrical Contractor shall provide 115/60/1 power for unit fan.

12. Electric Unit Heater EUH-1: Electrical Contractor shall provide 208/60/1 power for unit fan.

13. Future Radon Exhaust Fan: Provide 20 amp 120/60/1 circuit breaker serving attic panel for installation of future radon exhaust fan.

14. Plumbing Electrical Work: Electrical Contractor shall provide and wire power for the following:

    a. Potable Water Booster Pump
    b. Natural Gas Safety Shut-off Valve
    c. Elevator Sump Pump

15. All motors 1/3 HP and smaller shall be wired for 120 volt, 1 phase, 60 hertz; motors 1/2 hp and larger shall be wired for 208 volt, 1 or 3 phase, 60 hertz .

1.02 PERMITS

Installer shall apply for, obtain pay for all permits and inspections required by law and notify proper authorities in ample time for such inspections to be made.

1.03 QUALITY ASSURANCE

Work performed shall conform with all Local and State Rules and Regulations, National Fire Protection Association and the State of Maine Propane and Natural Gas Board Laws and Rules.

1.04 MATERIALS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be same manufacturer.

1.05 SHOP DRAWINGS

A. Before any material or equipment is purchased, Installer shall submit to the Architect five (5) copies of shop drawings for approval.

B. Review must be obtained on the following items:

1. Heating and Ventilating Equipment

Diffusers, Registers and grilles
Duct material
Duct sealant and wall/floor sealant
Fire dampers, sleeves and access doors
Exhaust Fans and Roof Hoods
Louvers with color selector chart
Roof Hoods
Pumps
Pipe, valves, unions and flanges for water, gas and drain
Automatic Flow Control valves with read-out gauge and pressure tappings
Air vents (automatic and manual)
Air separator
Relief valves
Expansion tank and accessories
Pipe hangers
Pressure gauges and thermometers
Triple duty valves
Boilers including burners
Pressure reducing valves
Exterior wall sleeves and accessories
Suction diffusers
Pipe flexible connectors
Pipe and valve markers
Baseboard radiation and convectors
Duct
Pipe fittings

Boiler and combustion air vents
HVAC equipment and piping
Temperature Controls
Sealant for pipe penetrations of walls/floors
Unit Ventilator with color selection chart
Wall Heaters

2. Plumbing Equipment

Waste, vent, cold and hot water piping material
Valves, and Pipe hangers
Backflow Preventor
Shock absorbers
Pipe markers
Identification (charts and tags)
Insulation
Mixing Valves
Indirect water heaters
Plumbing fixtures
Domestic hot water storage tanks
Recirculating DHW pump
Floor drains and cleanouts
Elevator pit sump pump
Trap primers
Plumbing pipe insulation
Cold water pipe shock absorbers
Laundra-mates
Areaway Drains

1.06 INSURANCE

Contractor shall purchase and maintain all Workmen's Compensation Insurance, Public Liability and Property Damage Insurance during the progress of work and until completion and acceptance of entire project by the Owner in the amounts as Owner determines.

1.07 GUARANTEE

Contractor shall guarantee all materials and workmanship furnished, including sub-contractors, to be free from all defects for a period of one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at without expense to Owner.

1.08 TEMPORARY HEAT

Contractor to provide temporary heat as required during construction. Heating shall be in accordance with OSHA, State and Local regulations. Contractor is responsible for any damage resulting from freezing water lines.

## PART 2 - EXECUTION

### 2.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect installed work of all other trades and verify that all work is complete to the point where this installation may properly commence.

2. Verify that heating and plumbing systems may be installed in strict accordance with all pertinent codes and regulations and the approved shop drawings.

B. Discrepancies

1. In the event of discrepancy, notify Engineer immediately.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 2.02 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective materials from the job site.
3. Install pipes to clear all beams and obstructions; do not cut into or reduce the size of load carrying members without the approval of the Engineer.
4. All risers and off-sets shall be substantially supported.
5. Make all changes in pipe size with reducing fittings. All low points in water piping shall be provided with an accessible plug tee or drain valve.
6. Pipe hangers shall be placed as follows: 1/2", 3/4" & 1" at 6'-0", 1 1/4" & 1 1/2" at 8'-0", 2" & 3" at 10'-0" and 4" and larger at 14'-0".
7. Install polymer grommets in hydronic heating piping penetrations through joists to prevent noise during piping expansion and contraction.

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside of fittings; use graphite on all plugs.
2. Make all joints in copper tube (heating hot water) with 95-5 tin-antimony solder applied in strict accordance with the manufacturer's recommendations.

### 2.03 CLOSING IN UNINSPECTED WORK

A. General: Do not cover up or enclose work until it has been inspected and approved.

B. Noncompliance: Should any work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required. After it has been inspected and approved, make all repairs and replacements with materials necessary for approval by the Engineer.

2.04 TEST AND ADJUST

A. During the installation, all hot water heating piping shall be tested with water to a pressure of 125 psi and held for a period of 4 hours. Any leaks shall be repaired and another test applied to the piping. All piping shall be tested before it is insulated or otherwise concealed.

B. Before operating the system, all of the new piping shall be flushed out to remove oil and foreign materials.

C. After the installation is complete and ready for operation, the system shall be tested under normal operating conditions in the presence of the Engineer and demonstrated that the system functions as designed.

D. It shall be demonstrated that all parts of heating system have a free and noiseless circulation of hot water and that all parts are tight. It shall also be demonstrated that all units are functioning properly and that control system operates correctly.

E. Should any defects in operation develop during the test periods, Installer will proceed to correct defects immediately. Additional tests will be conducted after correction.

2.05 CLEANING

Prior to acceptance of work, clean all exposed casings of the heating and plumbing installation, removing all labels and all traces of foreign substance.

2.06 EQUIPMENT IDENTIFICATION

A. Each fan, boiler, circulating pump and switch shall be identified with plastic identification tags. Tags to be engraved plastic equal to Setonply by Seton Name Plate Corp.

B. Identify natural gas, hot and cold water piping for sprinkler, plumbing and heating systems with Seton mark pipe markers by Seton Name Plate Corporation. Marker shall snap completely around pipe and be visible from all directions. Marker shall include both identification and direction of flow. Use yellow background with black letters for heating hot water supply and return, green with white letters for domestic cold and hot water supply return and drain piping.

C. Tag all valves (if not tagged by valve manufacturer) with 1-1/2" round brass tags and #6 bead chains. Tag shall be consecutively numbered. Provide valve charts identifying valve number, valve identification and service. Mount charts in 8 1/2" x 10" / 8 1/2" x 11" self-closing aluminum frame with plastic windows and locate as directed by Owner. Identify ducts and fire dampers with Ventmark HVAC markers.

END OF SECTION 15100

# SECTION 15250 - MECHANICAL INSULATION AND CONDENSATE PROTECTION

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and supplementary conditions and Division-1 Specification Sections apply to work of this section.

### 1.02 DESCRIPTION OF WORK

A. General: Insulate piping, ducts, equipment and elsewhere as specified in this Section or indicated on the drawings.

### 1.03 QUALITY OF COMPLIANCE

A. Fire and Smoke Ratings for all insulation systems:

Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, smoke developed index of 50 or less as tested by ASTM E 84 (NFPA 255) method.

Exception: Insulation installed on services located outdoors may have flame spread index of 75 and smoke developed index of 150.

B. Submittals: Submit manufacturer's technical product data, installation data, maintenance data, and certifications for each type of required insulation per Section 15000, Mechanical General Requirements.

## PART 2 - PRODUCTS

### 2.01 INTERIOR HOT AND COLD WATER PIPING INSULATION

A. Fiberglass Pipe Insulation : Preformed heavy density glass fiber insulation snap on type with single seam, vapor barrier and all service jacket (ASJ) with self-sealing lap. Insulation shall be rated for -20F to 500F minimum with a thermal conductivity value not more than 0.24 BTU-IN per hour per square foot, degree F at 75F mean temperature as rated by ASTM (335).

B. Fiberglass Pipe Fitting Insulation

1. All fittings shall be Zeston pre-molded Hi-Lo temperature PVC insulation fittings with two layers of pre-cut inserts. Covers shall be same color as jacketing material and by same manufacturer.

2. Ends of insulation on exposed pipes at valves, unions, flanges and equipment shall be finished with Zeston pre-molded covers. Fitting covers shall be sealed to adjacent insulation.

3. Valves, unions, flanges and piping within radiation enclosures shall not be insulated.

Note: No other type fitting insulation will be accepted

C. Provide shielding per Paragraph 3.6 I.

D. Exposed Piping: Wherever insulation is exposed it shall be covered with a white PVC plastic covering material. Covering shall be applied in no less than 4 foot lengths with shingle joints. Longitudinal joints shall be on the top or back sides so as to be out of sight and sealed with adhesive materials provided with the jacketing. Material shall be butted to finish walls, or Insulation Contractor shall be required to provide escutcheon plates. Jacketing material shall be Ceel-Tite 130 series, as manufactured by Ceel-Co. or approved equal. Provide samples if substituting. Exposed piping in the Mechanical Rooms are exempt from this requirement. Only the elbows the mechanical room are to have PVC jacket.

E. Manufacturers: One of the following: Certainteed, Owens-Corning or Knauf.

2.02 INTERIOR DOMESTIC HOT AND COLD WATER PIPING

Provide same as specified for hot and cold water piping in Paragraph 2.1.

2.03 DUCTWORK

Fiber glass duct wrap with factory supplied, non-combustible, vapor barrier facing. Thermal conductivity shall not be greater than 0.28 BTU/hour - square feet - F/inch. Duct wrap shall have UL label. All laps to be sealed and held in place with adhesive and flare staples. All lap joints to be folded under before stapling so no raw insulation will be showing. On bottom of ducts 24" or wider, mechanical fasteners shall be provided approximately 12" on centers.

All duct work included in fire resistive assemblies to have 1 1/2" thick 6 pcf ceramic fiber insulation wrap with foil scrim facers. Use 3M Firemaster Duct Wrap or approved equal.

2.04 MISCELLANEOUS MATERIALS

A. Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.

B. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

2.05 BOILER VENT AND COMBUSTION AIR

PVC vent and combustion air shall not be insulated.

PART 3 - EXECUTION

3.01 PLUMBING PIPING SYSTEM INSULATION

Omit insulation on exposed non-handicap type plumbing fixture runouts from face of wall or floor to fixture; on unions, flanges, strainers, flexible connections and expansion joints.

A. Insulate the following plumbing piping systems including exposed piping at handicap fixtures with insulation thickness specified in Table I.

Domestic cold water piping
Domestic hot water piping
Domestic hot water recirculating piping
Waste piping above living spaces. Wrap waste lines over living space ceilings with building insulation. Wrap waste pipe drop, elbow and 2 feet horizontal length with 1 ½" thick fiberglass insulation to deaden sound.

TABLE I
Minimum Pipe Insulation
Plumbing Thickness for Pipe Sizes

| Water Temperature | Mains and Branch Pipe Sizes | | | |
|---|---|---|---|---|
| | Up to 1" | 1" to <1-1/2" | 1-1/2" to <4" | Over 4" |
| F | Inch | Inch | Inch | Inch |
| 105+ | 0.5 | 0.5 | 1.0 | 1.0 |

Cold Water: 1-inch all pipe sizes

3.02 HEATING PIPING SYSTEM INSULATION

Omit insulation on hot piping 1) within radiation enclosures and unit cabinets 2) on heating piping beyond control valve located within heated space and 3) on unions, flanges, strainers, flexible connections, and expansion joints.

A. Insulate the following heating piping in thickness, in accordance with Table II following:

TABLE II
Minimum Pipe Insulation
Hot Water Heating Pipe Systems

| Design operating Temperature Range F | Insulation Thickness for Pipe Sizes | | | |
|---|---|---|---|---|
| | <1 | 1 to <1-1/2 | 1-1/2 to <4 | 4 to <8 |
| | Inch | Inch | Inch | Inch |
| 141-200 | 1.0 | 1.0 | 1.0 | 1.5 |
| 105-140 | 0.5 | 1.0 | 1.0 | 1.0 |

3.03 HVAC DUCT SYSTEMS INSULATION

A. Insulate the following ducts with 1-1/2" thick duct wrap:

1. All supply, return and exhaust ducts in attic space and horizontal duct connections between riser and motor operated damper.

2. All supply air ducts not lined.

3. Outside air intake duct and plenums.

## 3.04 INSTALLATION

A. Examine areas and conditions under which mechanical insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Install insulation products in accordance with manufacturer's written instructions and in accordance with recognized industry practices to ensure that insulation serves intended purpose.

C. Install insulation on mechanical systems subsequent to testing and acceptance of tests.

D. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation with single cut piece to complete run. Do not use pieces or scraps abutting each other.

E. Clean and dry mechanical surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

F. Maintain integrity of vapor-barrier jackets on mechanical insulation, and protect to prevent puncture or other damage.

G. Cover valves, fittings, and similar items in each piping system with equivalent thickness and composition or efficiency of insulation as applied to adjoining pipe run. Install factory molded, precut, or job fabricated units; except where specified form or type is indicated.

H. Extend mechanical insulation without interruption through walls, floors, and similar piping penetrations except where indicated otherwise.

I. Install protective metal shields and insulated saddles wherever needed to prevent compression of insulation.

J. Butt pipe insulation against pipe protection saddles and/or thermal hanger shields. For hot pipes, apply 3" wide vapor-barrier lap cement on butt joints and seal joints with 3" wide vapor-barrier tape or band.

K. Do not insulate fibrous glass ducts. Omit insulation on ducts where internal insulation or sound absorbing linings have been installed.

L. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

M. Installer of mechanical insulation shall advise Contractor of required protection for insulation work during remainder of construction period to avoid damage and deterioration.

END OF SECTION 15250

**SECTION 15300 - NFPA-13 SPRINKLER SYSTEM**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

General Provisions of Contract, including General and Supplementary conditions and General Requirements (if any) apply to work specified in this Section.

1.02 SCOPE

A. It is the intent of this contract to provide automatic dry type sprinkler fire protection of Chestnut Street Residential Lofts to conform to NFPA 13 sprinkler system. Provide freeze protected systems for all areas exposed to ambient air temperatures below 40F such as Garage, Canopies and Bicycle Storage.

B. Contractor shall provide Class III Standpipe System on each floor of Stairwells 1 and 2.

C. Contractor shall prepare hydraulic calculations of the fire protection systems in compliance with NFPA and I.S.O.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Painting: Section 09900 - Painting.

B. Electrical wiring: Division 16 sections.

1.04 CODE COMPLIANCE

A. NFPA Compliance: Install fire protection systems in accordance with NFPA-13: "Installation of Sprinkler Systems, 2002 Edition" and NFPA 14: "Installation of Standpipe and Hose Systems, 2003 Edition",

B. UL Compliance: Provide fire protection products in accordance with UL standards; provide UL label on each product.

C. City of Portland, Maine Compliance: Provide fire protection in accordance with City of Portland, Maine Sprinkler Code.

D. Screw Thread Connections: Comply with Portland Fire Department requirements for sizes, threading and arrangement of connections for fire department equipment to fire protection systems.

1.05 SUBMISSIONS

A. Submittal: Submit manufacturer's technical product data and installation instructions for fire protection materials and products.

B. Approval Drawings: Prepare approval drawings of fire protection systems indicating pipe sizes, pipe locations, fittings, shutoff and equipment. Submit to Agency having jurisdiction

for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

C. Approval Calculations: Prepare hydraulic calculations of fire protection systems. Submit to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation.

D. Certificate of Installation: Submit certificate upon completion of fire protection piping work which has been tested in accordance with NFPA- 13 and also that system is operational, complete, and has no defects.

E. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculations, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of Division 1.

1.06 QUALITY ASSURANCE

A. The entire fire protection automatic sprinkler system shall be designed, fabricated, installed and tested by a Contractor regularly engaged, a minimum of 5 years, in sprinkler installations of similar size and qualified to install sprinkler systems. Sprinkler Contractor shall submit evidence of qualifications to the Architect under sprinkler firm's letterhead and signed by senior official of the corporation.

B. In addition to complying with code compliance specified in Paragraph 1.3, conform to requirements of insurance underwriter, the 2003 International Fire Code and authority having local jurisdiction- City of Portland Fire Department, State Fire Marshall or both.

C. Provide and coordinate location of access panels for sprinkler heads installed in areas with concealed heads.

D. Provide adjustable, semi-recessed or two piece pipe escutcheons so that sprinkler head can be removed or repaired without damaging ceiling or ceiling tiles. Center sprinkler head in ceiling tile wherever possible.

E. All sprinkler piping shall be run concealed.

F. Coordinate location of exposed piping sprinkler heads with Architect.

1.07 WATER SUPPLY

A. Water supply shall be from municipal water system. Sprinkler Contractor shall test for available fire flow and pressure, report results in writing to Architect and adjust hydraulic calculations in accordance with sprinkler contractor's update water test. Coordinate tests with Portland Water District (PWD) subsequent to any PWD upgrade of water mains in street. The following is a report from PWD:

| | |
|---|---|
| Hydrant #:XXX | |
| Static Pressure: | XX PSI |
| Flow: | X,XXX GPM |

Date of Test: _____

1.08 INSTALLATION

A. All supervisory type valves and switches shall be automatic and interconnected to Fire Alarm Control Panel.

PART 2 - PROTECTION

2.01 PIPING MATERIALS AND PRODUCTS

Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as determined by Sprinkler Contractor to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection piping systems. Where more than one type of materials or products are indicated, selection is Sprinkler Contractor's option. All materials shall be in accordance with NFPA-13R requirements.

2.02 IDENTIFICATION

Provide identification in accordance with the following listing:

A. Fire Protection Valves - Plastic valve tags.

B. Fire Protection Signs - Provide the following signs.

At each sprinkle valve, sign indicating what portion of system valve controls.

At each outside alarm device, sign indicating what authority to call if device is activated.

C. Install fire protection signs on piping in accordance with NFPA -13 requirements.

D. Provide master schematic line diagram of sprinkler mains identifying pipe run and risers, major valves, test points, disconnect and shutoffs. Mount diagram on laminated plastic board and hang on wall near front door. Coordinate location with Architect.

2.3 PIPES AND PIPE FITTINGS

Provide pipes, and pipe fittings in accordance with the following listing:

A. Black Steel Pipe - Schedule 40 for less than 8"; Schedule 30 for 8" and larger; Class 125, cast-iron threaded fittings and threaded joints, or mechanical grooved pipe couplings and fittings; cut-groove type.

B. Black Steel Pipe - Schedule 10 for 5" and smaller; 0.134" wall thickness for 6"; and 0.188" walls thickness for 8" and 10"; wrought-steel; butt welding fittings and welded joints, or mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type.

C. Comply with requirements of NFPA -13 for installation of fire protection piping materials. Install piping products in accordance with manufacturer's written instructions, and in

accordance with recognized industry practices to ensure that piping systems comply with requirements and serve its intended purposes.

D. Coordinate with other work, including plumbing piping, as necessary to interface components of fire protection piping properly with other work.

E. Install drain piping at low points of piping systems. Provide dry drum drips where required.

F. Install fire department connection valves in piping where required.

G. Install paddle water flow indicators.

H. Install manual shutoff at each audible alarm station.

I. Install Inspector's test connection at most remote point from riser.

2.04 PIPING SPECIALTIES

Provide piping specialties in accordance with the following:

Pipe escutcheons
Dielectric unions
Drip pans
Pipe sleeves
Sleeve seals
Fire Barrier Penetration Seals equal to SpecSeal Series 100 Sealant or equal by Hilti or 3-

2.05 SUPPORTS AND ANCHORS

Provide supports and anchors in accordance with the following listing: Adjustable steel clevis hangers, adjustable steel band hangers, or adjustable band hangers, for horizontal-piping hangers and supports. Two-bolt riser clamps for vertical piping supports. Steel turnbuckles and malleable-iron sockets for hanger-rod attachments. Concrete inserts, top-beam C-clamps, side beam or channel clamps or center beam clamps for building attachments.

2.06 VALVES

Provide valves in accordance with the following listing:

A. Sectional Valves - Gate valves or butterfly valves; UL-listed.

B. Check Valves - Swing check valves; UL-listed.

C. Dry-Pipe Valves - Provide cast-iron dry-pipe valves, differential type, 175 PSI working pressure.

OR

D. Alarm Check Valve - Provide cast-iron water flow alarm check valve, 175 PSI working pressure.

E. Fire Department Connection Valves - Provide flush type fire department connection iron swing check valve, 175 PSI rated working pressure and constructed of polish brass.

2.07 METERS AND GAGES

Provide meters and gages in accordance with the following listing: Pressure gages, 0-250 PSI range.

2.08 FIRE PROTECTION SPECIALTIES

Provide fire protection specialties, UL-listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.

A. Water-Motor Gongs - Provide weatherproof, red enameled finish, water-motor gongs.

B. Low Air Pressure Horn - Provide low air pressure horn as indicated.

C. Air-Pressure Maintenance Device, Dry-Pipe System - Provide air-pressure maintenance device for dry-pipe standpipe piping as recommended by the manufacturer.

D. Supervisory Switches - Provide products recommended by manufacturer for use in service indicated.

E. Fire Protection Specialties Manufacturers - Allen (W.D.); Croker-Standard; Elkhart Brass; Grinnell Fire Protection Systems; Grunau Sprinkler; Guardian Fire Equipment; Potter Roemer; or Western Fire Equipment.

F. Tamper switches for control valves.

G. Install fire protection specialties as indicated and in accordance with NFPA- 13.

Furnish wiring requirements to electrical installer for electrical wiring of supervisory switches.

2.09 AUTOMATIC SPRINKLERS

Provide automatic sprinklers in accordance with UL and FM listing. Provide fusible links for 165F (74C) unless indicated otherwise.

Upright
Pendent
Vertical sidewall and Horizontal sidewall
Semi-recessed pendant
Flush dry-type pendent
Standard dry-type pendent and Standard dry-type upright

A. Finish - White colored for occupied areas, cast brass for all other areas.

B. Sprinkler Cabinet and Wrench - Furnish steel, baked red enamel, sprinkler box with capacity to store 12 sprinklers and wrench sized to sprinklers.

C. Automatic Sprinklers Manufacturers - Automatic Sprinkler; Grinnell Fire Protection Systems; or Viking.

2.10 FIRE DEPARTMENT CONNECTION

Provide wall flush type 4" Stortz cast brass connections and escutcheon plate assembly per City of Portland Fire Department requirements including fire department inlets with female hose connections, American National fire hose connection screw thread, equipped with individual drop clapper valves, equipped with plugs and chains, construction features as indicated, and constructed with the following additional construction features:

A. Finish - Rough brass.

B. Inlet Pipe - 4" pipe.

C. Cast Lettering - "AUTO. SPKR.".

D. Escutcheon - 12" diameter or 7" x 14" rectangular.

E. Manufacturers - Croker-Standard; Elkhart Grass; or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Work shall be started as soon as the general construction permits.

B. Risers are to be plumbed with adjacent construction.

C. O.S. & Y. gate valves are to be aligned with adjacent walls or partitions to provide maximum clearance.

D. Contractor shall be responsible for coordinating work with other trades.

3.02 SPRINKLER PIPING FLUSHING

Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA -13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.03 HYDROSTATIC TESTING

After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 PSI or at 50 PSI in excess of maximum static pressure when maximum static pressure is

in excess of 150 PSI. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.

A. Dry-Pipe Testing - Test dry-pipe hydrostatically except, in freezing conditions, test with air at pressures not less than 50 PSI, for a period of 2 hours. Check system for leakage. Leave differential dry-valve clappers open during test, to prevent damage.

B. Repair or replace piping system as required to eliminate leakage in accordance with NFPA standards for "little or no leakage" and retest as specified to demonstrate compliance.

3.04 EXTRA EQUIPMENT

A. Extra Heads - For each style and temperature range required, furnish additional sprinkler heads, amounting to one unit for every 100 installed units, but not less than 5 units of each.
B. Extra Wrenches - Furnish 2 spanner wrenches for each type and size of valve connection and fire hose coupling.
C. Cabinet - Emergency cabinet shall be a 12 capacity standard metal cabinet with head wrench and required spare heads.

3.05 QUALIFICATION

This contractor shall be well qualified by previous experience to complete this installation and may be required to submit evidence of such qualification to the engineers.

3.06 GUARANTEE

This contractor shall guarantee all materials and workmanship to be free from all defects for a period of one (1) year from date of final acceptance, and shall make good, repair or replace any defective work within that time at his own expense and with no cost to the owner.

END OF SECTION 15300

# SECTION 15400 - PLUMBING

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, as well as 15100, "Mechanical General Requirements," apply to work of this section.

### 1.02 DESCRIPTION

A. Work Included:

All labor, materials, equipment and transportation shall be provided as required to completely install plumbing and water systems with all connections, as shown on drawings and described in these specifications, or as required by the State of Maine Plumbing Code. Accompanying drawings do not show every detail of pipe, valves, fittings, hangers, equipment and fixtures, which are necessary for complete installation, but are provided to show general arrangement and extent of work to be performed.

Plumbing System required for this work includes, but is not limited to:

Gas entrance
Water service entrance
Building sewer piping connections to outside building wall
Hot, cold and re-circulated domestic hot water piping within building
Soil, waste, and vent systems
Floor drains, valves and backflow preventer
Domestic water heating piping system
Plumbing fixtures and trim
Pipe insulation
Connections to fixtures furnished by Others
Pipe hangers and supports
Piping and equipment identification
Tests
Fire and smoke sealing of pipe penetrations of partitions and floors
Radon pipe system where shown

B. Work Not Included

All required excavation work such as backfilling and grading
All required masonry, carpenter work, cutting, patching and furring.
Flashing for vents through roof
Temporary toilets and temporary water
Electrical work
Heating, air conditioning and ventilating work except for condensate drains
Painting except as specified in this section

### 1.03 CODES

A. Work done by this Contractor shall conform to Local and Maine State Plumbing Codes having jurisdiction. State and Local Codes are considered part of these specifications.

B. State of Maine Plumbing Code shall be minimum requirements for system. Where drawings show more stringent requirements than the State Code, drawings shall be adhered to.

1.04 CROSS CONNECTIONS

A. No piping shall be installed to permit back-siphonage or flow of any liquid into water service piping under any conditions.

B. Air gaps, funnel type drains and approval vacuum breakers shall be provided as required by the Maine State Plumbing Code. Piping to hose end faucets shall have vacuum breakers.

1.05 CUTTING AND PATCHING

A. Plumbing Contractor shall be responsible for informing various trades of sizes and locations of all chases, hole sleeves and supports required for plumbing work within the building structure.

B. Architect shall be notified and approval must be received for any chases and holes which are needed by this Contractor if they involve cutting away steel, concrete, brickwork, or digging under foundation walls. Plumbing Contractor will be held responsible for any damage resulting from work not approved by Architect.

PART 2 - PRODUCTS

2.01 PIPE

A. Soil, Waste, Vent and Radon

1. Schedule 40 PVC.
2. All exposed piping or tubing in finished areas shall be chrome plated. All chrome trim with wrench marks shall be removed and new trim installed.

B. Domestic Water Piping

1. All hot and cold water piping above finish floor (not buried) shall be hard-drawn type "L" copper tube.

**Note: Other types of copper tubing such as Types M or ACR shall not be substituted for Type L.**

2. Piping and fittings shall be soldered with Silverbrite 100 lead-free solder from Engelhard Corporation, Mansfield, Massachusetts. Solder shall have nominal composition of 95.5 tin/4 copper/0.5 silver and be lead antimony and zinc free. Solder shall conform with the Safe Water Drinking Act and Amendments. Solder shall be listed by ASTM B-32, IAPMO (UPC) and BOCA.
3. All buried cold water piping shall be type "K" soft copper tubing.

4. All buried hot water piping shall be run in Schedule 40 PVC sleeve or trenches. Do not direct bury hot water piping.
5. All exposed water piping, in finished areas shall be chrome plated I.P.S. copper or brass pipe or tubing and fittings. Valves shall also be chrome plated brass or bronze. Any chrome trim with wrench marks shall be removed and new trim installed.
6. Type of tubing shall be stamped or printed on each length by Manufacturer.

C. All PVC piping penetrating a fire rated walls, chase walls or floors shall be sealed with Choke Collars equal to PCS Pipe Choke System.

2.02 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation; locate to permit easy operation, replacement and repair.
2. All valves must be so constructed that they may be repacked under pressure while open.
3. Globe valves shall be installed in all lines where regulation is required.
4. Check valves shall be installed in all lines where flow may reverse from intended direction.
5. Valves shall have name and/or trademark of manufacturer as well as working pressure stamped or cast on valve body.
6. Valves shall comply with Manufacturer's Standards Society (MSS) specifications and be so listed.

B. Quality

All valves shall be by one manufacturer. The following list is provided as a means of identifying quality and type required.

1. Gate valves 2-1/2" in size and larger shall be iron body, bronze trimmed, OS&Y, solid wedge, bolted bonnet, flanged ends and rated for 125# WSP, 200# WOG.
2. Gate valves 2" in size and smaller shall have bronze bodies, rising stem, solid wedge, union bonnet and rated for 150# WSP, 300# WOG.
3. Globe valves 2-1/2" in size and larger shall have iron bodies, bronze trim, OS&Y, solid disc, bolted bonnet, gland packed, flanged ends and rated for 125# WSP, 200# WOG.
4. Globe valves 2" and smaller shall have bronze bodies, union bonnet, renewable composition disc for the service intended, and rated for 150# WSP, 300# WOG.
5. Check valves 2-1/2" and larger shall be horizontal swing type with iron body, bronze trim, flanged ends and rated for 125# WSP, 200# WOG
6. Check valves 2" and smaller shall be horizontal swing type with bronze body, Teflon disc and rated for 125# WSP, 200# WO4G.
7. Drain valves shall be Ball valves as described above, except to have standard hose threads on one end with hose cap and chain.
8. Butterfly valves 2" and smaller shall be bronze body, stainless steel stem and disc with Viton seal, calibrated memory stop.
9. Ball valves 2" and smaller shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blow-out proof stems and adjustable stem

gland and shall be equipped with suitable packing for the service intended. Valves shall be rated for 600# WOG.

## 2.03 PIPE SLEEVES AND ESCUTCHEONS

### A. Sleeves

1. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than pipe. Piping passing through walls other than masonry shall be provided with #24 gauge galvanized steel tubes with wired or hemmed edges.
2. Sleeves set in concrete floors shall finish flush with underside, but extend minimum of 1 inch above finish floor. Weld clips to sleeves for support in concrete pre-cast planks of a size which will be covered by concrete topping. Sleeves set in partitions shall finish flush with each side.
3. Space between sleeves and pipes shall be sealed to make smoke and water tight with intumescent SpecSeal Series 100 sealant or equal by Hilti or 3-M.
4. Masonry sleeves shall be Schedule 40 steel pipe. Sleeve through foundation walls shall be Link Seal modular mechanical type as manufactured by Thunderline Corporation.

### B. Escutcheons

Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

## 2.04 HANGERS AND SUPPORTS

### A. General

1. All hangers and supports shall be especially manufactured for that purpose, and shall be the pattern, design and capacity required for location of use.
2. Piping specified shall not be supported from piping of other trades.
3. All steel hangers shall be factory painted.
4. Hangers shall be heavy duty steel adjustable clevis type, plain for steel, cast iron and plastic pipe and copper plated for copper tubing equal to Carpenter & Paterson Inc., Fig. 100 (Fig. 100CT copper plated).
5. Hangers shall go outside of insulation for all piping.
6. Exposed vertical risers 3/4 inch and smaller shall be supported at 6 foot intervals between floor and ceiling with split ring type hangers; copper plated for copper tubing equal to Carpenter & Paterson Inc., Fig.81 (Fig. 81CT copper plated).
7. Piping suspended from walls and partitions shall be supported by steel support bracket with adjustable clips equal to Carpenter & Paterson Inc., Fig. 69. All attachments to bar joists shall be from top chord.

### B. Hanger Rods & Attachments

1. Hanger rods shall be cadmium plated all thread rod. Rod size shall be 3/8 inch for piping 2 inch and under; 1/2 inch for 2 1/2" to 6"; 5/8 inch over 6".
2. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks and compound anchor shields and bolts in poured concrete.

3. Provide toggle bolts with rod couplings for fastening in pre-cast concrete plank decks.
4. Provide and install angle iron supports for pipe hangers in locations as required. Angle iron supports shall be adequate size for span and piping or equipment.
5. Hot and cold water piping at each fixture shall be securely fastened in wall with split ring type hanger fastened to studs within wall.

## 2.05 EXPANSION LOOPS AND ANCHORS

Provide expansion loops on domestic hot water supply and circulating return lines where required to control expansion. Provide rigid anchors where required. Anchors shall be bolted collars held by angular braces in direction of piping. Provide guides on each side of all expansion joints.

A. Traps

1. Traps of material and design as approved by the State shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, keeping all trap screws below water line; vent each trap. Make off-sets in vent piping with 45 degree angle fittings when possible. Pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps, at fixtures and appliances shall be provided with accessible clean outs.
2. All exposed traps under sinks and lavatories, and all piping and fittings shall be chrome-plated.

B. Cleanouts

Provide cleanouts for soil and waste piping where shown on the drawings and as required by code.

1. Floor Cleanouts: All floor cleanouts in concrete or tile shall be flush with finish floor, round adjustable tops, vandal proof, bronze plug and gasket seal, bronze top, flashing flange with flange device, inside caulk. Units shall be Smith Fig. 4026-F-C-U or equal by Zurn, Fig. Z-1405-C-NB or Wade, Fig. W-6010-5-72-118. Units in carpeted areas shall be provided with carpet markers.
2. Wall Cleanouts: All wall cleanouts shall be "tee" fittings with bronze slotted plug with lead seal, stainless steel cover with vandal proof screw, Smith Fig. 4531-U, Zurn Z-1455-1 or Wade W-8460-R-5. All cleanouts shall be "tee" fittings with bronze slotted plug with lead seal, stainless steel cover with vandal proof screw, Smith Fig. 4531-U, Zurn Z-1455-1 or Wade W-8460-R-5.
3. Flashing: Flash each second floor clean out with 4 lb. sheet lead extending 24" beyond perimeter of clean out and lock into clamping collar.

C. Floor Drains: All floor drains shall be complete and provided with flashing flange and flange device.

## 2.06 TRAP PRIMERS

Furnish and install self adjusting automatic trap primers equal to Sioux City or as manufactured by Precision Plumbing Products Inc. Provide distribution unit for outlets required.

2.07 SHOCK ABSORBERS

All piping shall be protected from water hammer or shock by approved shock absorbing devices. Shock protection shall be provided where required. Units to be as manufactured by Smith, Sioux Chief, Josam or Zurn, P.D.I. approved equal.

2.08 SOUND INSULATION

Wrap waste lines over living space ceilings with building insulation. Wrap waste pipe drop, elbow and 2 feet horizontal length with 1 ½" thick fiberglass insulation to deaden sound. See also Section 15250.

2.09 THERMOMETERS

Thermometers shall be Ashcroft or approved equal 2" industrial dial type bi-metal single temperature scale with temperature range 0F-250F. Provide stem length and thermowell as required for pipe size.

2.10 PRESSURE GAUGES

Pressure gauges shall be Ashcroft or approved equal 2-1/2" Standard all stainless steel with pressure range of 30 PSI, polycarbonate window, bourdon tube and socket.

2.11 IN-LINE CIRCULATORS

Provide as specified in Section 15510, Hot Water Piping System and Specialties.

2.12 BACKFLOW PREVENTER

A. Provide and install all necessary components to provide protection against potentially hazardous backflow or back siphonage and the contamination of the potable water system at the required GPM demand.

B. Unit shall be health hazard area Class III reduced pressure type. Watts Series 909 or approved equal from Hersey Products Inc. or FEBCO.

C. Unit shall be UL, USC, ASSE, 1APMD and AWWA approved.

D. Provide drain funnel where required and testing equipment.

E. Provide pressure gauge on each side of unit.

F. Unit shall meet State of Maine and Water Department Model Cross-Connection Control Program, 1980.

2.13 PLUMBING FIXTURES

A. General

Important Note:

All brass components of faucets in contact with water supply shall contain no more than 3% lead content by weight.

This Contractor shall furnish and install all plumbing fixtures shown on drawings and as scheduled. Fixtures and fittings shall be as specified or as approved equal from American Standard, Kohler or Crane. Exact count of fixtures shall agree with architectural drawings.

B. All fixtures to be white vitreous china where not specified otherwise.

C. All exposed stops, risers to faucets, traps, piping and fittings under lavatories and sinks shall be chrome- plated. All concealed items may be brass or copper. Provide acid resisting where required. Provide drilling of lavatories and sinks to match actual faucets and accessories provided.

NOTE: ALL PIPING DROPS TO FIXTURES SHALL BE ANCHORED SOLID TO WALL WITH A STEEL SUPPORT BRACKET WITH ADJUSTABLE CLIP, ESPECIALLY PIPING TO FLUSH VALVES.

D. Rough-in and mount all fixtures at dimensions shown on Architectural Drawings not as shown on Plumbing Drawings.

**FIXTURES:**

**Water Closet P-1**

Mansfield 130-160, 1.6 gpf ULF Toilet, standard tank two piece, vitreous china, or approved equal with coordinated Church regular residential white seat, closed front with cover and TOP-LOC hinge with non-corrosive tightening bolts, wing nuts and no-slip washers.

**Water Closet P-2 (ADA Approved)**

Mansfield 137-160 17"H 1.6 gpf Toilet two piece, standard tank, vitreous china, elongated ULF rim, or approved equal with coordinated Church elongated white seat, open front less cover and stainless steel external check hinges.

**Lavatory Wall Hung P-3**

Mansfield Lavatory Grand Isle Model 2018HB-NS-1, vitreous china wall hung lavatory for concealed arm carrier, high splash back rim and front overflow. Provide faucet holes 4" centers.

Faucet shall be Delta, centerset 4" centers single lever handle with metal drain assembly and ADA Approved.

McGuire chrome plated angle supply with 3/8" O.D. x 12" flexible riser, 1/2" nominal copper

sweat key stop, 5" extension tube and bell escutcheons. McGuire Semi-Cast adjustable P-Trap, 1-1/4" x 1-1/4", cleanout plug, tubing to wall with cast escutcheon for maximum clearance under lavatory.

**Lavatory Wall Hung P-4 (ADA Approved)**

Mansfield Wheelchair Lavatory Model 315-4 ADA Approved vitreous china wall hung lavatory for concealed arm carrier, concealed anti-splash rim and front overflow. Provide faucet holes 4" centers.

Faucet shall be Delta, centerset 4" centers single lever handle with metal drain assembly and ADA Approved.

McGuire chrome plated angle supply with 3/8" O.D. x 12" flexible riser, 1/2" nominal copper

sweat key stop, 5" extension tube and bell escutcheons. McGuire Semi-Cast adjustable P-Trap, 1-1/4" x 1-1/4", cleanout plug, tubing to wall with cast escutcheon for maximum clearance under lavatory.

Insulate hot water and drain piping with ADA approved TRUEBRO Lavguard under lavatory for protection of legs.

**Tub/Shower P-5**

LASKO Model 2603-CT one piece 60"W x 33-1/4"D x 73-1/4"H tub/shower. Provide Symmons Temptrol S-96-2-131-X pressure balancing mixing valve, integral diverter and volume control, tub spout, single blade lever control, 2.5 GPM shower head and integra stops.

**Shower P-6**

Provide Lasco 1363-FBSC or approved equal, one piece, white, Acrylic, barrier free shower module with maximum 2" dam height, ADA certified unit, RH or LH as shown on architectural drawings, 36"W x 36"D x 77-1/8"H- O.D. Unit to have anti-skid floor, molded soap dish, shower rod, drain, grab bars and fold-up transfer seat.

Symmons 1-117VT-FS-X-3-3H-B24 or equal Safety-Mix Visu-Temp shower unit, pressure balancing valve with integral service stops, 3 gallon flow restrictor, super shower heads, wall/hand shower spray, service stops, in-line vacuum breaker, metal hose and 24" bar in lieu of a hook. Provide seat specified by Architect.

**Kitchen Sink P-7**

Elkay LRAD 3322-8-4, double bowl, Type 302 18 gauge stainless steel, 33" x 22" x 6". Faucet shall be
Delta, single handle with spray and hose.

LK-35 Duo strainer, LK-8 grid strainer and stop valves.

**Dishwasher P-8 (FBO)**

Dishwasher to be provided by others. Provide plumbing waste, vent, hot and cold water services.

**Clothes Washer P-9 (FBO)**

Clothes washer to be provided by others. Provide plumbing waste, vent, hot and cold water services. Provide Symmions W-600-X or approved equal from Zurn or Watts

**Service Sink P-10**

Service Sink shall be molded stone or pre-cast terrazzo, as manufactured by Fiat Products or equal. The molding shall be done in matched metal dies under heat and pressure resulting in a one piece homogeneous product. Size of unit shall be 36" x 24" x 10" high and have an integrally molded shelf 10 9/16" wide where indicated. Fiat MSB-2424Series.

Unit shall have 10" high walls with not less than 1" wide shoulders.
The drain body shall be cast brass, chrome plated, complete with cast brass lock nut and gaskets. A combination dome strainer and lint basket made from #302, 16 gauge stainless steel attached with tamper proof screws shall be included. The drain body shall provide for a lead caulked joint to be 3" I.P.S.

Provide and install the following items:

Stainless steel guard.
Service faucet with vacuum breaker; integral stops and wall brace.
30" Hose with 3/4" coupling at one end.
Stainless steel mop hanger; 24" long with (3) holders, wall mounting.
Silicone sealant.

**Floor Drains P-11**

Cast iron body flashing collar, sediment bucket, nickel bronze, 7" diameter adjustable strainer head, inside caulk, with trap primer. Zurn ZN-415 or equal by Watts, MIFARB, Josam, Smith or Wade.

**Non-Freeze Hose Bibbs P-12**

Nickel bronze face, exposed, mounted, all bronze casing and interior parts, integral backflow preventer, anti-siphon, non-freeze, key lock and 3/4" hose connection, Zurn Z-1310 Ecolotrol, Wade W-8620 Enviro/Guard, Smith 5609-NB-Line Guard.

**Roof Drains P-13**

Furnished by others. Make piping connections and install insulated rain leaders.

**Trench Drain P-14**

Zurn Z-XXX drain with 4" pipe connection

**Traps and Stops**

All exposed piping, traps, stops and risers to faucets shall be chrome plated. All concealed may be rough brass or copper.

2.14 DOMESTIC HOT WATER HEATER

Furnished by hot water boiler manufacturer.

2.15 ELEVATOR SUMP PUMP

Myers sump pumps or approved equal. Note oil minder switch and alarms is not required.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect installed work of all other trades and verify that all such work is complete to the point where this installation may commence.
2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and approved Shop Drawings.

B. Discrepancies

1. In event of discrepancy, notify Architect.
2. Do not proceed with installation in areas of discrepancy until such discrepancies have been resolved.

3.02 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of at least 1/8 or 1/4 inch per foot for all horizontal waste and soil piping within the building; pitch all vents for proper drainage; install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect. Do not hang or support piping from other piping or from electrical conduit.
5. Back vent all fixtures. Increase vents one size before going through roof up to and including 3" size.
6. All risers and off-sets shall be substantially supported.
7. Pipe hangers shall be placed as follows: Bell and spigot pipe, 5'-0" (at hub), steel piping except air piping 10'-0"; copper tubing and air piping; 1/2" at 6'-0", 3/4" and 1" at 8'-0"; 1-1/4" and larger at 10'-0".
8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
9. Make all changes in pipe size with reducing fittings.

10. All low points in water piping shall be drained with 1/2" gate valve with hose nipple and metal cap.
11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.
2. Pack all joints in cast iron soil and waste pipe and fittings using oakum and securing with one inch deep lead caulking, fully and properly caulked and smoothly finished.
3. Smoothly ream all cut PVC pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer's recommendations.
4. Make all joints in copper water tube with Silvabrite 100 lead-free solder applied in strict accordance with the manufacturer's recommendations.
5. Make all joints in copper gas tube with Silvabrite 100 lead-free applied in strict accordance with the manufacturer's recommendations.

## 3.03 CLOSING IN UNINSPECTED WORK

A. General: Do not cover up or enclose work until it has been properly and completely inspected and approved.

B. Noncompliance: Should any work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as necessary to the approval of Architect and at no additional cost to Owner.

## 3.04 TESTING

Tests shall be applied to plumbing installation as required by codes and where as directed by Architect, and in all cases before work is covered by earth fill or pipe covering.

A. Piping

1. Sanitary systems shall be securely stopped, except at highest point above roof, and the entire system filled with water to point of overflow. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed.
2. New hot water, cold water, and gas piping shall be subjected to a hydrostatic pressure test of 150 psi and shall be repaired and repeated until work is tight.

## 3.05 CLEANING

A. Prior to acceptance of buildings, clean all exposed portions of plumbing installation, removing all labels and all traces of foreign substance, using only a cleaning solution

approved by manufacturer of plumbing item, being careful to avoid all damage to finished surfaces.

B. Clean out all strainers and aerators, and adjust or replace washers, cartridges, etc., to prevent leaks at faucets, stops, shower valves, and pop-up drains.

3.06 IDENTIFICATION

See Section 15100, "Mechanical General Requirements".

3.07 STERILIZATION OF PIPES

A. General

1. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association, and in accordance with all pertinent codes and regulations.
2. Chlorinate only when the building is unoccupied.

B. Flushing

1. Upon completion of the sterilization, thoroughly flush the entire potable water system.
2. When sterilization and flushing are complete, sample shall be collected from the end of longest main, or at any other location selected by Architect, and water analysis test provided. Test must prove the water acceptable or additional disinfecting of system performed. A copy of test report shall be submitted to Architect.

END OF SECTION 15400

# SECTION 15488 - NATURAL GAS

## PART 1 - GENERAL

### 1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections apply to work of this section.

1.02 Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with NFPA 54 where applicable. Base pressure rating on natural gas system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in natural gas systems. Where more than one type of materials or products are indicated, selection is Installer's option.

### 1.03 QUALITY COMPLIANCE

ANSI Compliance: Comply with applicable provisions of ANSI B31.2.

NFPA Compliance: Comply with applicable provisions of NFPA 54, 2003 Edition.

Utility Compliance: Comply with requirements of Northern Utilities, Inc.

State of Maine Compliance: Propane and Natural Gas Board Laws and Rules, 1998 Edition.

Submittal: Submit manufacturer's technical product data, assembly type shop drawings, ladder type wiring diagrams differentiating between portions of wiring that are factory installed and portions to be field installed, and maintenance data.

Trenching and Backfill: Not work of this section.

## PART 2 - PRODUCTS

### 2.01 GAS SERVICE PIPING

A. All Pipe Sizes: Black steel pipe; Schedule 40; wrought-steel butt welding fittings.

B. Wrapping: Machine wrap pipe using 50% overlap wrap, with polyvinyl chloride tape. Hand wrap fittings using 100% overlap wrap extending 6" beyond fitting onto wrapped pipe.

### 2.02 BUILDING DISTRIBUTION PIPING

A. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; malleable-iron threaded fittings.

B. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; wrought-steel butt welding fittings.

2.03 PIPING SPECIALTIES

A. Escutcheon Plates: Install on each pipe penetration exposed to view in occupied spaces.

B. Sheet-Metal Pipe Sleeves: Install on each pipe penetration through interior partitions and ceilings.

C. Cast-Iron Pipe Sleeves: Install on each pipe penetration through exterior walls or footings, both above and below grade.

D. Steel Pipe Sleeves: Install on each pipe penetration except as otherwise indicated.

E. Sleeve Seals: Install in sleeves in foundation walls below grade and in exterior walls; either caulked lead and oakum or modular mechanical rubber link seals.

2.04 SUPPORTS AND ANCHORS

A. General: Provide factory fabricated supports and anchors complying with MSS SP-69. Install, complying with MSS SP-89.

B. Gas Cocks:

1. Gas service valves 2-1/2" and larger shall be lubricated plug type with iron bodies, lubricated iron plug, flanged ends and wrench operated and rated for 175# WOG. (Provide one (1) valve wrench for each size valve and turn over wrenches to Owner's Representative)

2. Gas service valves 2" and smaller shall be butterfly type with bronze body, stainless steel stem and disc with Viton seal, AGA approved and UL Listed. Supply with "T" or lever handle as approved by local gas supplier.

C. Install at connection to gas train for each gas-fired equipment item; on branches and risers as indicated.

PART 3 - EXECUTION

3.01 GENERAL

A. No person other than an authorized employee of Northern Utilities, Inc., shall repair, alter, or make connections to a gas pipe upstream of the meter or restore gas service to the premises.

B. Gas meters should be installed within five feet (5') of the service entrance to a building and at least three feet (3') distance from any electrical, switching gear, transformers or outlets.

C. The Installer is responsible for his own work, including proper sizing, proper materials, supports and testing.

D. Piping Certificate, Form 1-79 PAL, available from Northern Utilities, Inc., must be submitted to Northern Utilities, inc., before gas service will be activated to any location where:

1. a new piping system is installed
2. addition or repairs to an existing piping system are made
3. a piping system has been exposed to fire
4. new appliance is installed

3.02 GAS SERVICE

A. General: Arrange with Northern Utilities, Inc., to provide gas service to indicated location with shutoff at terminus. Consult with Utility as to extent of it's work, costs, fees and permits involved. Pay such costs and fees; obtain permits.

B. Extend service pipe from Northern Utilities, Inc., terminus to inside building wall under Utilities' direction.

C. Mechanical Contractor shall provide shutoff outside building downstream of gas meter where indicated. Gas service valve box with cover on upstream side of meter shall be by Northern Utilities.

3.03 EQUIPMENT CONNECTIONS

A. General: Connect gas piping to each gas-fired equipment item with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.

B. Provide shutoff in gas service pipe at entry in building. Extend pipe to gas meter location indicated. Provide parts and accessories required by Utility to connect meter.

3.04 PIPING TESTS

A. Test natural gas piping in accordance with NFPA 54 and Northern Utilities, Inc.

3.05 PIPING INSTALLATION

1. Install natural gas piping in accordance with applicable codes and Northern Utilities, Inc., requirements.
2. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints. Pipe joint compound shall be used on all threaded joints.
3. Remove cutting and threading burrs before assembling piping.
4. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
5. Plug each gas outlet, including valves with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.

6. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

7. Install drip-legs in gas piping at each riser at point where it is joined to horizontal run of pipe and where required by code or regulation.
8. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
9. Use dielectric unions where dissimilar metals are joined together.
10. Install piping with 1/64" per foot (1/8%) downward slope in direction of flow.
11. Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hot water piping above 180°F. (93°C); between any gas piping and any other hot surface such as breaching.
12. No supply run to be smaller than 3/4" ID.
13. All material to be new and unused when piping is to be concealed.
14. Metallic pipe and fitting threads shall be taper threads and shall comply with the standard for pipe threads. General purpose (inch) ANSI/ASME B 1.20.1.
15. When installing gas piping which is to be concealed, the following shall not be used: Unions, tubing, fittings, threads, right and left couplings, bushings and swing joints made by combinations of fittings. Only elbows, tees and screw couplings are approved for use in concealed piping.
16. Piping passing through concrete, brick, concrete block, walls or floor is to be sleeved or protected from corrosion.
17. Piping in floors is to be protected from corrosion.
18. Piping underground, beneath buildings is prohibited.
19. Piping is not to be embedded in concrete floor.
20. Drop pieces are to be run full size to the appliance. Any reduction in the pipe size is to be done as close to the appliance as possible.
21. Prohibited Locations: Gas piping inside a building shall not be run in or through a circulating air duct, clothes chute, chimney or gas vent, ventilating duct, dumb waiter, elevator shafts or underneath buildings.
22. When any other fuel gas is to be interconnected with the natural gas system, Northern Utilities, Inc., should be contacted to advise the proper method.
23. Prohibited Concealed Piping:

    a. Concealed gas piping shall not be located in solid partitions (concrete or cinder block). Tubing shall not be run in hollow walls or partitions unless protected against physical damage.
    b. Concealed gas piping shall not be run horizontally through hollow walls or partitions.
    c. Valves, cocks or any shutoff devices shall not be installed in concealed gas piping.

## 3.06 APPLIANCE INSTALLATION

A. All appliances will be installed in accordance with manufacturer's recommendations. The recommendations will appear on name plate or on separate instructions which accompany the appliance. This information will list minimum clearance to combustible material and other information required for proper installation.

B. A separate shutoff will be installed in an accessible location at each appliance.

## 3.07 TESTING

A. Every new or enlarged system of gas piping must be tested and the proper completed form submitted to Northern Utilities, Inc., (Piping Certificate 1-79 PAL) before gas will be turned on.

B. Testing for Tightness: (NFPA 54, Page 33 - 4.1.2 (A.) OXYGEN SHALL NOT BE USED AS A TESTING MEDIUM. Note: A proper test cannot be made with appliances connected. This could also result in expensive damage to the controls on the appliance. Gas meter must also be isolated from section being tested, as pressure back against meter will cause extensive internal damage.

C. Test Pressure: Minimum test pressure for low pressure delivery in concealed gas piping systems (below 1/4 psi) shall be no less than 25 psig for a time period of one hour. Minimum test pressure for high pressure delivery systems (above 1/4 psi) shall be no less than 65 psig for one hour for piping under 2". 100 psi for piping above 2" or where pipe is welded. During pressure test, all joints shall be tested with a soap and water solution. Any leaks found will be repaired and system again tested.

D. After successful pressure test, piping shall be connected to meter and the appliance connected to piping system.

E. All outlets including those with shutoff valve, shall be closed gas-tight with plug or cap if threaded. Any pipe left temporarily shall be plugged or capped gas-tight. If flanged, a blind flange and proper gasket shall be installed.

3.08 NOTICE

Northern Utilities, Inc., responsibility for gas piping in any installation is limited to pipe and fittings which comprise service entering installation up to and including outlet connections of the meter or meter bar. All meters shall be installed within five feet of service entrance. Where special requirements prohibit installation of meters within five feet (5') of service entrance, Northern Utilities, Inc., shall be contacted to obtain authorization to proceed with an alternate meter piping configuration under requirements specified by the Company.

END OF SECTION 15488

# SECTION 15510 - HOT WATER HEAT PIPING SYSTEM AND SPECIALTIES

## PART 1 - GENERAL

### 1.01 DESCRIPTION OF WORK

Furnish and install piping, fittings, valves, hangers anchors and water specialties required by this section or as indicated on drawings.

### 1.02 QUALITY OF COMPLIANCE

A. Piping

1. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
2. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel code, Section IX, for shop and job-site brazing of piping work.

B. Valves

1. Valve Types: Provide valves of same type by same manufacturer.
2. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body. See also Section 15100, "Mechanical General Requirements".
3. Codes and Standards: ANSI Compliance: For face-to-face and end-to-end dimensions of flanged-end or welded-end valve bodies, comply with ANSI B16.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".

C. Delivery, Storage and Handling

1. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
2. Where possible, store pipe and tube inside and protected from weather. When necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
3. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

## PART 2 - PRODUCTS

### 2.01 PIPING

A. Pipe Materials

1. Headers over 2" Schedule 40 Standard Weight, Black Steel ASTM 120

2. Piping 2" and smaller Type "L" hard drawn copper tubing

**Note: Substitution of Type M or Type ACR tubing will not be allowed.**

B. Pipe Fittings

| | | |
|---|---|---|
| 1. | Screwed | 125# cast-iron, screwed pattern ASTM A126, ASA B16.1 |
| 2. | Welded | Standard weight butt weld, carbon steel ASTM A234, ANSI B16.9 from A106 Gr.B., seamless tube |
| 3. | Unions | 250 malleable iron, brass to brass seats |
| 4. | Flanges | 150# forged steel slip-on ASTM A234 |
| 5. | Sweat | Cast bronze or wrought copper made up with 95-5 solder |
| 6. | Connections to equipment | 2" smaller - screwed unions 2-1/2" larger - flanged |

2.02 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation. Locate to permit easy operation, replacement and repair. All pressures specified are steam working pressure.
2. All valves shall be constructed to permit repacking under pressure while open.
3. Globe valves shall be installed in all lines where regulation is required.
4. Check valves shall be installed in all lines where flow may reverse from intended direction.
5. Except for globe and check valves specified above, gate or ball valves shall be installed in all supply and return lines and on all drain lines. See Paragraph 2.6(B) for radiator valves.
6. All valves to comply with Manufacturers Standards Society (MSS) and be so listed.
7. All valves 2-1/2" and larger shall be O.S.& Y. type.
8. Valves shall have name and/or trademark of manufacturer, as well as working pressure stamped or cast on valve body.

B. Type and Manufacturers

The following list is provided as a means of identifying the quality and type required:

1. Gate valves 2-1/2" in size and larger shall have iron body, bronze trim, OS&Y, solid wedge, bolted bonnet and flanged ends. Rated for 125# WSP, 200# WOG.
2. Gate valves 2" in size and smaller shall have bronze bodies, rising stem, solid wedge, union bonnet rated for 150# WSP, 300# WOG.

3. Globe valves 2-1/2" in size and larger shall have iron bodies, bronze trim, OS&Y, solid disc, bolted bonnet, gland packed, flanged ends. Rated for 125# WSP, 200# WOG.
4. Globe valves 2" and smaller shall have bronze bodies, union bonnet, renewable composition disc for the service intended. Rated for 150# WSP, 300# WOG.
5. Globe valves, Plug Type, 2" and smaller shall have bronze bodies, union bonnet, stainless steel plug type disc and seat. Rated for 150# WSP, 300# WOG.
6. Check valves 2-1/2" and larger shall be horizontal swing type with iron body, bronze trim and flanged ends. Rated for 125# WSP, 200# WOG.
7. Silent check valves 2" and larger shall be iron body, wafer style, bronze and stainless trim, 125# class for use with ANSI 125 or 150 flanges.
8. Check valves 2" in size and smaller shall be horizontal swing type with bronze body, Teflon disc. Rated for 125# WSP, 200# WOG.
9. Butterfly valves 2-1/2" and larger shall be full lug type, with threaded bolt holes, iron body, aluminum bronze discs, stainless steel stems and EPDM seats which are replaceable. Rating for 200# WOG, 240° F. Handles of valves up to 6" in size shall be lever-lock type with 10 position throttle plate and adjustable memory stop. Valves 8" and up shall be gear operated with position indicators. Valves are to be installed between bronze, iron or steel Class 125 or 150 flanges, using cap screws of sufficient length to thread into the body of the valve itself. NO GASKETS are to be used between the flanges and valve body.
10. Butterfly valves 2" and smaller shall be bronze body, stainless steel disc and stem with Viton seal, calibrated memory stop.
11. Ball valves 2" and smaller shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats an seals, blow-out proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Rated for 600# WOG.

## 2.03 HANGERS AND SUPPORTS

### A. General

1. All hangers and supports shall be specially manufactured for that purpose and shall be pattern, design and capacity required for location of use.
2. Piping specified shall not be supported from piping of other trades.
3. Hangers shall be steel adjustable clevis type; plain for steel pipe and copper plated for copper tubing equal to Carpenter & Paterson, Inc., Fig. 100 (Fig. 100 CT copper plated).
4. Exposed vertical risers 3/4 inch and smaller shall be supported at mid-point between floor and ceiling with split ring type hangers; copper plated for copper tubing equal to Carpenter & Paterson, Inc., Fig. 81 (Fig. 81 CT copper plated).
5. Piping suspended from walls, trench walls and partitions shall be supported by steel support bracket, equal to Carpenter & Paterson, Inc., Fig. 69.
6. All steel hangers shall be factory painted.

### B. Hanger Rods

1. Hanger rods shall be cadmium plated all thread rod. Rod size shall be as follows:

| Pipe Size | Rod Size |
|---|---|
| 1/2" to 2" | 3/8" |
| 2-1/2" to 3-1/2" | 1/2" |
| 4" & 5" | 5/8" |
| 6" | 3/4" |
| 8" To 12" | 7/8" |

2. Provide toggle bolts for fastening to concrete blocks and compound anchor shields for bolts for fastening to poured concrete.
3. Provide lag points with rod couplings or side beam connectors with drive screws for fastening to wood.
4. All nuts for hanger rod to be stainless steel.

C. Supports

Provide and install angle iron supports for pipe hangers as required. Angle iron supports shall be adequate size for span and piping or equipment load.

## 2.04 PIPE SLEEVES AND ESCUTCHEONS

A. Sleeves

1. Heating Installer shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than the pipe. Pipe passing through walls other than masonry shall be provided with #24 gauge galvanized steel tubes with wired or hemmed edges.
2. Sleeves set in concrete floor shall finish flush with the underside, but extend a minimum of 1 inch above the finish floor. Sleeves set in partitions shall finish flush with each side.
3. Spaces between sleeves and pipes within building shall be caulked to make fire, smoke and water tight with 3M Brand Fire Barrier Caulk CP25 or Putty 303.

B. Escutcheons

Where uninsulated piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates. Provide deep type floor plates as required for projecting sleeves. Piping through walls with insulation shall not require escutcheons.

## 2.05 ANCHORS, EXPANSION COMPENSATION AND GUIDES

A. Anchors shall be provided and installed as detailed and shown on drawings, or as required to control expansion.

B. Install expansion joints where indicated, and elsewhere as determined by Heating Installer to provide adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors and pipe alignment guides as indicated and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and torsional stress.

C. Fabricate expansion loops in locations indicated and elsewhere, as determined by Heating installer to provide for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.

D. Provide pipe alignment guides on both sides of expansion joints, and elsewhere as indicated. Construct with 4-finger spider traveling inside guiding sleeve, with provision for anchoring to building substrate.

2.06 HOT WATER SPECIALTIES

A. Automatic Flow Control Valves (AFCV)

1. Provide AFCV in piping where indicated. Valves shall have readout ports to facilitate connecting of differential pressure meter. Each readout valve shall be fitted with an integral EPT check valve designed to minimize system fluid loss during monitoring process. Each balancing valve shall have indexing pointer and calibrated nameplate to indicate the degree of closure of precision machine orifice. Each circuit setter shall be constructed with interval O-ring seals to prevent leakage around rotating element, and sized to read flow rate at minimum 1.5 psig water pressure.
2. Provide with submittal drawings, a complete schedule listing circuit setters to be provided, location, GPM flow through each valve, size and pressure drop.
3. Circuit setters shall be Bell & Gossett or equal from Taco with working pressure of 125 psig and maximum operating temperature of 250°F.

**Note: Substitution of Circuit Setters for AFCV shall not be made.**

B. Drains: Baseboard radiators shall have drain plug or valve located in low point of circuit between shutoff valves. Drain valves shall be ball valves as specified under VALVES with hose connections.

C. Air Vents

1. Air vents shall be installed in the piping and at equipment as indicated on plans or as may be required.
2. Automatic air vents shall be Armstrong air vent traps No. 1-AV 1/2" with stainless steel trim or equal to Anderson or Sarco. Gate valves shall be installed with each unit and drains from vents shall be run as indicated on the plans. An air chamber shall be installed at each air vent. Vent shall be line sized for all piping up to 2" pipe size; 2" vent for larger piping.
3. Manual air vents shall consist of air chamber with Dole No. 14 Key Valve with copper tube extension. Install valve in accessible location.
4. Provide vent plugs or caps at high points in baseboard radiator circuits.

D. Expansion Tanks

1. Tanks: Furnish and install pre-pressurized diaphragm type hot water expansion tank precharged to 12 psi. Tank shall be constructed of steel for 125 psi working pressure in accordance with ASME Code, and have tappings for water connections and charging valve. Tanks shall be Amtrol Extrol Model 60 or approved equal.

    a. Tank shall be installed with manual shut-off valve between the tank and the system.
    b. Tank shall be TACO or equal from Bell & Gossett or Armstrong with capacity as shown on drawings.

E. Make-up Water Backflow Preventer: Furnish and install where shown, a check valve type backflow preventer equal to Watts No. 9D. Unit shall include shut-off valves before and after the device.

F. Water Pressure Reducing Valve: Furnish and install pressure reducing valve with brass body construction and built-in strainer in cold water piping connected to hot water heating system as shown on drawings. Valve shall be adjustable and be No. 335, as manufactured by TACO or equal by Bell & Gossett.

G. Triple Duty Valve: Furnish and install straight pattern triple duty valves (check, balance and shut-off) equal to TACO Model MPV or Bell & Gossett 3S Series. Valve shall be sized to provide flow measurement at GPM scheduled for pumps on drawings.

H. Air Separator: Furnish and install air separator by TACO or equal by Bell & Gossett.

I. Piping Flexible Connectors

1. Braided Hose Flexible by Keflex or approved equal.
2. Connectors shall be suitable for hot water application and rated a minimum of 150 psi at 220°F.

J. Thermometers

Thermometers shall be Ashcroft or approved equal 2" industrial dial type bi-metal single temperature scale with temperature range 0F-250F. Provide stem length and thermowell as required for pipe size.

K. Pressure Gauges

Pressure gauges shall be Ashcroft or approved equal 2-1/2" Standard all stainless steel with pressure range of 30 PSI, polycarbonate window, bourdon tube and socket.

## 2.07 PUMPS

A. General

Hot water circulating pumps shall be furnished by boiler manufacturer.

## PART 3 - EXECUTION

### 3.01 PIPING

A. General

1. Provide and erect in accordance with best practice of trade all hot water supply and return, drain and vent piping shown on plans, and as required to complete intended installation. Installer shall make off-sets as shown or required to place all piping in proper position to avoid other work, and to allow application of insulation and finish painting.
2. All piping shall be installed within building insulation.
3. Size and general arrangements, as well as methods of connecting all piping, valves, and equipment shall be as indicated, or to meet requirements for complete installation.
4. All piping shall be erected to provide for easy and noiseless passage of hot water under all working conditions. Inverted eccentric reducing fittings shall be used whenever hot water pipes reduce in size.
5. All hot water mains shall be run level or pitch slightly upward so that no air pockets are formed in piping. Mains shall be set at elevations so runouts feeding heating equipment shall have no pockets where air can collect or vents shall be provided.
6. Provide drains at all low points in piping system.
7. In erection of hot water piping, care must be taken to make allowance for expansion and contraction. Piping shall be anchored as necessary to control expansion.
8. Runouts to hot water radiation shall be size indicated on plans. Runouts shall come off the main downward or off the side with minimum of three 90 degree elbows provided on runout from main to drop or rise to radiation.
9. Install a sufficient number of unions to facilitate assembly and disassembly of piping and removal of equipment.
10. All mains 2-1/2" and larger, shall have welded connections using standard factory-fabricated tees, elbows, reducers and caps. Branch outlets in welded sizes shall be made with tees for full size or one size reduction and with either "Weldolets" and "Threadolets" or factory shaped nipples for all other sizes. All welds shall be made by qualified welders capable of welding in any position "in the field". All welds shall conform with the rules set forth in the Standard Manual on Pipe Welding of the Heating, Piping and Air Conditioning Contractors National Association. All slip-on fittings shall be back welded.
11. Steel piping 2" and smaller shall have screwed connections. All threads on piping must be full length and clean-cut with inside edges reamed smooth to the full inside bore.

### 3.02 VALVES

A. General

1. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping.

Locate valves so as to be accessible and so that separate support can be provided when necessary.

2. Install valves with stems pointed up in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

B. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

C. Wafer Check Valves: Install between 2 flanges in horizontal or vertical position; position for proper direction of flow.

D. Lift Check Valve: Install in piping line with stem vertically upward; position for proper direction of flow.

3.03 WATER SPECIALTIES

A. Thermometers

1. Install thermometers in vertical upright position, and tilted so as to be easily read by observer standing on floor.
2. Install thermometers in the following inlet and outlet locations, and elsewhere as indicated: Each hydronic boiler
3. Thermometer Wells: Install in piping tee where indicated in a vertical upright position. Fill well with oil or graphite; secure cap.

B. Pressure Gauges

1. Install pressure gauges in piping tee with pressure gauge cock located on pipe at most readable position.
2. Locations: Install in the following locations and elsewhere indicated.

    a. At suction and discharge of each pump.
    b. At discharge of each pressure reducing valve.

3. Pressure Gage Cocks: Install in piping tee with snubber. Install syphon for steam pressure gauges.
4. Pressure Gauge Connector Plugs: Install in piping tee where indicated. Locate on pipe at most readable position; Secure cap.

3.04 PUMPS

A. Install pump as recommended by manufacturer and as shown in details on drawings.

B. Connect electrical service to pump terminal block as shown by manufacturer and required by codes. If automatic control of circulator is required, provide motor starter or contactor.

C. Fill system and vent it of all air. Purge pump of air as recommended by manufacturer; check for proper rotation.

D. Place pump in service and check power draw, voltage and proper system operation.

E. Report the actual current draw and pump flow and other information required by Section 15880, "Testing, Adjusting and Balancing."

3.05 ADJUSTING AND CLEANING

A. Adjusting: Adjust faces of thermometers, meters and gauges to proper angle for best visibility.

B. Cleaning: Clean windows of thermometers, meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.06 IDENTIFICATION

See Section 15100, "Mechanical General Requirements".

END OF SECTION 15510

# SECTION 15620 - BOILERS

## PART 1 - GENERAL

### 1.01 DESCRIPTION OF WORK

A. Extent of natural gas boiler work required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Related work not included in this section, and specified elsewhere:

1. Concrete Pads: Division 3, "Concrete"

2. Piping and Specialties: Section 15510, "Hot Water Piping System and Specialties".

3. Electrical: Section 15100, "Mechanical General Requirements" and Division 16 Sections.

4. Insulation: Section 15250, "Mechanical Insulation and Condensate Protection".

### 1.1 QUALITY OF COMPLIANCE

A. I-B-R Compliance: Cast-iron boilers shall be tested and rated in accordance with Institute of Boiler and Radiator Manufacturers (I-B-R) and bear I=B=R emblem on nameplate affixed to boiler.

B. NFPA Compliance: Install gas-fired boilers in accordance with National Fire Protection Association Standard 54 "National Fuel Gas Code", 2002 Edition.

C. ASME Compliance: Construct gas-fired boilers and indirect water heater in accordance with American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section IV.

D. UL Labels: Provide gas-fired boiler electrical components that have been listed and labeled by Underwriters Laboratories (UL).

E. State of Maine Compliance

Installation of boilers shall conform to State of Maine Propane and Natural Gas Board: "Laws and Rules".

PART 2 - PRODUCTS

2.1 BOILERS

A. General

1. Provide and install where shown on drawings high efficiency type wall hung natural gas boilers with working pressure up to 50 psig. Boilers shall have circulating pump for space heating and domestic hot water circulation, anti-frost device, automatic bypass, gas vent accessories and outdoor probe.

2. Boilers shall have stainless steel DHW heat exchanger and burner. Provide self-check automatic control system, overheat limit thermostat, gas control electronic panel, differential pressure switch for flue products, differential pressure switch to prevent boiler operation in event of low water or blocked pump flow and inspection filter on domestic water entrance. Provide 43 PSI safety relief valve

Boilers shall be rated for minimum 85% AFUE and bear ASME H Stamp.

4. Boilers shall be Luna 310Fi Series or approved equal

B. Boiler and Pump Control

Provide integrated boiler management control or approved equal.

C. Cleaning

Boilers shall be cleaned per manufacturer's installation instructions.

D. Light-off Service

Installing Contractor shall make arrangements for light-off and shall notify Owner and Architect to have representatives on hand for instructions and to witness performance tests conducted in connection with the light-off.

E. One Year Service

Each boiler-burner unit shall be provided with free service period of one (1) year after acceptance by Owner. This service will include parts replacement and repair, excluding normal maintenance and adjustment. This service shall be a factory authorized service.

F. State Inspection

After installation is complete and operating, Contractor shall arrange with Maine Gas Burner Licensing Board (separate from insurance inspection) to have installations inspected. A copy of inspector's report shall be forwarded to the Architect.

PART 3 - EXECUTION

3.01 GENERAL: Install boilers where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices to ensure that units comply with requirements and serve intended purposes.

3.02 ACCESS: Provide access space around equipment for service as indicated, but in no case less than that recommended by manufacturer.

3.03 INSTALLATION OF BOILERS

A. General: Comply with boiler manufacturer's instructions for installation and with installation requirements of local and state boiler codes and applicable provisions of NFPA and ASME Boiler Code Standards.

B. Install boilers on 4" high concrete pad. Maintain manufacturer's recommended clearances around and over top of boiler.

C. Install boiler trim not installed at factory.

D. Furnish to Electrical Installer manufacturer's wiring diagram and electrical requirements for installation of field-wiring required for boilers.

END OF SECTION 15620

## SECTION 15750 - HEATING TERMINAL UNITS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. General

Furnish and install heating terminal units required by this section and as indicated on drawings.

B. Related work not included in this section, and specified elsewhere:

1. Ductwork: Section 15841, "Low and Medium Pressure Ductwork and Accessories."
2. Piping and Specialties: Section 15510, "Hot Water Piping System and Specialties."
3. Electrical: Section 15100, "Mechanical General Requirements" and Division 16.

1.02 QUALITY OF COMPLIANCE:

1. Baseboard Radiation, Wall Heaters and Cabinet Unit Heaters: Equipment shall be IBR rated.

2. **Thermostats: All thermostats shall be non-mercury type.**

PART 2 - PRODUCTS

2.01 BASEBOARD RADIATION

A. Baseboard radiation shall consist of 3/4" O.D. copper tube rated at 630 BTUH minimum at 1 GPM, 190F average water temperature and 65F entering air temperature. Radiators shall be supported by approved slide cradle hangers and brackets spaced a maximum of 48" O.C. Provide return line hangers where required. All baseboard shall have dampers.

B. Baseboard covers shall be and constructed of steel. End covers, inside and outside corners, trim strips, pilaster covers, wall sleeve and wall sleeve supports shall be provided.

C. All baseboard radiation shall be Petite 7 as indicated on drawings. No substitutes will be accepted.

2.04 CABINET UNIT HEATERS

A. Furnish and install hot water floor mounted cabinet unit heaters where shown on the drawings. Unit shall have heating capacity and standard CFM ratings shown.

B. Provide two complete sets of throw away type filters for each unit; one set to be used during construction and other set installed when project is completed.

C. Units shall be as manufactured by Trane Company or approved equal.

2.05 WALL HEATERS: Provide hot water surface wall heaters with unit mounted line voltage thermostat and locally controlled fan speed switch by Beacon Morris or approved equal.

2.06 GAS FIRED UNIT HEATER (GFUH-1): Reznor or approved equal.

2.07 ELECTRIC UNIT HEATER (EUH-1): Markel or approved equal

2.08 AUTOMATIC TEMPERATURE CONTROL

A. Boiler and Pump Control: See Section 15620, BOILERS

B. Hot Water Baseboard: Wall mounted zone thermostat shall cycle zone hot water circulator to satisfy space temperature setting. Thermostat shall be single stage, non-mercury type with large lettering by Honeywell and no others.

C. Cabinet and Wall Heaters: Provide factory unit mounted thermostat to cycle heating element and fan to satisfy space temperature setting of 60F.

D. Bathroom Exhaust Fans (EF-1): Fan and vanity light shall operate from common wall mounted switch furnished and wired by Division 16.

E. Kitchen Area Exhaust Fans (EF-2): Fan shall operate from remote manual switch provided and wired by Division 16.

F. Plumbing and HV Air Shaft Exhaust Fans (EF-3 through EF-13): Provide timer switch in Utility Room capable of scheduling each fan individually. Fans shall operate according to schedule input of timer. Timer shall be equal to Paragon Electronic 365-Day programmable 1 Channel Timer with automatic daylight saving time changeover, manual override, 7-day programming with 8-day holiday and 9-volt lithium battery for 275 Hours carryover.

G. Gas Fired Unit Heater (GFUH-1): Provide factory unit mounted thermostat to cycle heating element and fan to satisfy space temperature setting of 45F in Trash Room.

H. Electric Unit Heater EUH-1: Provide factory unit mounted thermostat to cycle heating element and fan to satisfy space temperature setting of 55F for elevator machinery room.

I. HVAC-1, HVAC-2 and HVAC-3:

PART 3 - EXECUTION

3.01 GENERAL

Install heating and ventilating terminal units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

3.02 TESTING & BALANCING

A. Contractor shall provide all necessary instrumentation, tools and ladders to complete work.

B. Instrumentation shall be in accordance with AABC, NEBB or SMACNA requirements and shall be calibrated to accuracy standards demanded by these organizations.

C. Flow-measuring hoods (manufactured, not fabricated) will be acceptable for measurement of ceiling diffuser performance only.

D. Contractor shall assume full responsibility for safe keeping of all instrumentation during the course of work.

E. Contractor shall adjust equipment in accordance with capacities shown on drawings, with permissible tolerances as follows:

| | |
|---|---|
| Exhaust Fans | +5% to 10% |
| Heating GPM | 0% to -10% |

F. Contractor shall obtain specified GPM requirement through circulating pumps and baseboard radiation by adjustment to specified pressure drop required.

G. Submit test and balancing air and water flow data in writing to architect.

H. For a period of one month following submittal of test and balance report, Contractor shall make such adjustments as may be deemed necessary by Owner or Engineer to achieve complete satisfaction in system operation.

3.03 BASEBOARD RADIATION

Seal all cracks or openings between hanger strip, (or back plate and radiation enclosure) and wall or partition prior to painting.

END OF SECTION 15750

1/3/2006

# SECTION 15772- SPLIT SYSTEM HVAC UNITS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections apply to work of this section.

### 1.2 SCOPE

Provide Split System type HVAC units as indicated and consisting of compressor, condenser, evaporator coil, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers. Provide capacities and electrical characteristics as scheduled.

### 1.3 QUALITY COMPLIANCE

A. ARI Compliance: Test and rate split system units in accordance with ARI 210; sound test and rate unit in accordance with ARI 270 and provide Certified Ratings Seal.

B. ASHRAE Compliance: Construct refrigerating system in accordance with ASHRAE 15. Provide EER not less than prescribed by ASHRAE 90A.

C. UL Compliance: Provide split system units which is designed, manufactured, and tested in accordance with UL requirements. Unit shall have UL label.

D. Submittals: Submit manufacturer's technical product data, assembly-type shop drawings, wiring diagrams, and maintenance data per Section 15100, "Mechanical General Requirements".

E. Special Project Warranty: Extend warranty to 5-years for compressor and coil.

F. Space Availability: Indoor and outdoor sections of units must fit within space made available for them as shown on drawings. Space available as shown are maximum including accessories.

G. Manufacturers: Indoor and outdoor units shall be by Bryant Heating and Cooling Systems or approved equal from McQuay, Trane or Carrier.

## PART 2 - PRODUCTS

### 2.1 INDOOR UNIT

A. Provide factory-assembled and tested upflow packaged unit as indicated, consisting of cabinet, hot water heating coil, refrigerant cooling coil fans filtters and unit controls.

B. Quality Compliance:

DOE and FTC Compliance: Provide unit that has been rated and tested according to Department of Energy (DOE) test procedures and Federal Trade Commission (FTC) labeling regulations.

UL Compliance: Provide packaged units which are UL Listed.

Note: Equipment without DOE/FTC or UL compliance will not be accepted under any circumstances.

C. Blower:

Fans shall be four speed, direct drive type, resiliently mounted and integral overload protection. Blower bearings shall be self-lubricating.

D. Accessories:

Filters: Provide two (2) sets of 2" pleated media air filters.

E. Cooling Coil:

1. Casing: Unit casing shall be constructed of galvanized steel with 1/2 inch thick neoprene-coated fiberglass insulation on all interior surfaces. Provide access panels to refrigerant coil and components and filters. Provide primary and secondary drain connections external to casing. Casing shall have enamel finish in manufacturer's standard color. Provide low voltage terminal board or control box. Fan motor relay and transformer shall be factory mounted and wired internally.

2. Evaporator: Evaporator coil shall be copper tube-aluminum fin type with refrigerant connections extended out through casing. Evaporator shall have drain pan internal refrigerant tubing and refrigerant flow controls (or thermal expansion valve) factory mounted. Evaporator shall be evacuated, dehydrated and charged with holding charge of nitrogen.

3. **Refrigerant shall Puron only (R-22 is not acceptable).**

2.2 OUTDOOR UNITS

A. Outdoor Units:

Furnish and install air cooled compressor-condenser unit with heavy gauge steel cabinet finished with weather resistant paint in manufacturer's standard color. Unit shall have puron refrigerant scroll compressor with internal overload protection, off-cycle crankcase heaters and mounted on rubber pads. Compressor shall have internal high pressure relief valve. Electrical controls shall be weather protected. Provide weatherproof disconnect switch as recommended by unit manufacturer.

B. Condenser: Condenser shall be all aluminum construction, vertical air discharge and single speed condenser fan. Provide factory supplied liquid line filter drier, refrigerant charge and start capacitor and relay. Condenser fan shall have wire fan guard.

C. Accessories:

1. Low ambient protection to 0F
2. Low ambient pressure switch
3. Evaporator freeze thermostat
4. Winter start control
5. Compressor start assist capacitor and relay
6. Liquid line solenoid valve
7. Ball bearings for condenser fan and motor

D. Automatic Temperature Control:

1. Overview:

Split system unit manufacturer shall provide automatic control of indoor and outdoor units from unit terminal strip, safety controls and operation to low ambient limits. Mechanical Contactor shall furnish room thermostat and unitary controllers to provide heating, cooling, OCCUPIED/UNOCCUPIED scheduling and fan control functions; as well as shut down unit on detection of smoke by smoke detector.

2. Occupied:

Indoor unit fan shall run continuously and thermostat shall cycle for first stage of cooling and mechanical cooling for second stage of cooling to maintain set point. Thermostat shall also activate hot water heating coil. Air proving sensor shall monitor fan status and prevent mechanical cooling if fan is not running. Provide outside air sensor to activate heating when mixed air falls below 70F (adjustable).

3. Unoccupied:

Indoor unit fan remains off. On a call for heating, fan shall start and operate through safety devices until space temperature is satisfied. Provide pushbutton 4-hour timed override of unoccupied cycle.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. General: Install split system indoor and outdoor units in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

B. Support: Install outdoor unit on steel supports and suspend indoor unit from steel angles, rods and isolators.

C. Electrical Wiring: Install electrical devices furnished by manufacturer, but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. Verify electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to Equipment Installer.

D. Ductwork: Refer to Section 15841, "Low Pressure Ductwork and Accessories". Connect supply and return ducts to unit with flexible duct connections. Provide transitions to exactly match unit duct connection sizes.

E. Start-up split system indoor and outdoor units in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

END OF SECTION 15772

1/3/2006

## SECTION 15841 - DUCTWORK AND ACCESSORIES

### PART 1 - GENERAL

### 1.01 DESCRIPTION OF WORK

A. Extent of low pressure ductwork is indicated on drawings and in schedules, and by requirements of this section. Low pressure ductwork is defined as ductwork subjected to velocities of 2500 FPM or less, and operating pressure of 2" w.g. or less, positive or negative.

B. Sheetmetal Work

1. Ducts from Bathroom and Kitchen Exhaust fans to air shafts
2. Exhaust ducts
3. Gas Dryer vents
4. Exhaust Fans, Louvers, Roof Hoods and Fire Dampers
5. Residential Range Hoods
6. Ducts from shafts to roof fans
7. Fire Protection sealing of all duct wall and ceiling/floor penetrations.

### 1.02 QUALITY COMPLIANCE

A. SMACNA Standards: All duct including prefabricated dual-wall duct shall comply with SMACNA "HVAC Duct Construction Standards Metal and Flexible"; 2nd Edition 1995.

B. ASHRAE Standards: Comply with ASHRAE Handbook 2004 HVAC Systems and Equipment, Chapter 16 "Duct Construction", for fabrication and installation of ductwork.

C. BOCA: Comply with the International Mechanical Code/2003.

D. NFPA Compliance: NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems", 2003 Edition.

E. Dimensions

The size of ducts marked on the drawings will be adhered to as closely as possible. The right is reserved to vary duct sizes to accommodate structural conditions during progress of work with-out additional cost to Owner. Duct layout is schematic to indicate size and general arrangement only. All ducts shall be arranged to adjust to "field conditions". Sheet Metal Installer shall coordinate work with Electrical Contractor and other trades.

PART 2 - PRODUCTS

2.01 DUCTS

A. Ducts shall be constructed of galvanized steel in accordance with high and low pressure duct construction standards specified by SMACNA "HVAC Duct Construction Standards-Metal & Flexible," 2nd Edition, 1995.

B. Dampers: All dampers shall be a minimum of #22 gauge and stiffened as required for pressure class. Do not use splitter dampers.

C. Sealant: Duct shall be sealed, including outside air intakes with water-based, non-toxic, non-combustible sealant equal to Multi-Purpose by Transcontinental Equipment Limited. Flame-spread rating shall not exceed 25 and smoke-developed rating shall not exceed 50 for sealant.

D. Duct Access Doors: Hinged insulated access doors with seals shall be provided in duct at motor operated damper. Access door to be provide at fire dampers not accessible through grille, diffuser or louver.

E. Fire Dampers: Furnish 2-hour rated Type B fire dampers with sleeves by LLOYD or equal. Provide duct access door for each fire damper.

F. Boiler Combustion and Ventilating Air: Per boiler manufacturer's requirements.

G. Exhaust Grilles by fan manufacturer and PRIDE wall registers.

2.02 RESIDENTIAL RANGE HOODS: Residential Range Hoods shall be re-circulating (non-ducted) type and UL Listed for residential range hood service. Hoods shall be sheet metal with a finish to match range color provided by Owner. Hoods shall include 75 Watt light bulb field installed, removable charcol filter and hood mounted switches for 75 Watt light and re-circulating fan. Residential Range Hoods shall be Nutone RL6200 or approved equal. Coordinate hood dimensions with cabinets installed.

2.03 EXHAUST FANS:

A. EF-1 and EF-2: Exhaust Fans shall be ceiling type, direct drive with integral thermal overload protected motors, centrifugal wheel and backdraft damper. Unit shall be constructed to permit access to fan and motor without disturbing ductwork. Provide with ceiling radiation damper to maintain fire rating of ceiling. Fans shall not exceed SONE rating indicated on drawings. Ceiling Fans shall be Cook or equal from Penn, Greenheck or ACME.

Note: Mount fans in horizontal position in shaft wall.

B. EF-3, through EF-15: Exhaust fans shall be centrifugal roof ventilators (CRV) with galvanized housing, backward inclined blades, hinged access hood with restraining bars, bird screen, vibration isolators, regreasable bearings, stainless steel locking hasp, adjustable drives, thermal overload protected ODP motor, pre-wired safety disconnect switch, and roof curb. Fans shall not exceed SONE rating indicated on drawings.

2.04 LOUVERS:

1. Louver shall be "hurricane" stationary vertical blade type. Units shall be 6" deep with 99.9% water removal efficiency in 50 mph wind with 14" per hour rain fall. Louvers shall be by American Warm Air Ventilating Inc. or approved equal.

2. Louvers shall have KYNAR custom-color painted finish. Submit color chip to Architect for review.

PART 3 - EXECUTION

3.01 GENERAL

Assemble and install ductwork in accordance with recognized industry practices to achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, and capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.

3.02 SEALING DUCT

After installation to seal class recommended in SMACNA "HVAC Duct Standards - 1st Edition 1985". Use sealant described in Paragraph 2.1 (G) of this section. All joints in sheet metal ducts shall be made airtight, and all branches and turns shall be made with long radius elbows and fittings. If long radius elbows are not used, elbows shall be provided with fixed double wall turning vanes designed to reduce resistance of the elbow to equivalent of a long radius elbow with throat radius not less than duct width.

3.03 LOCATION OF DUCT

A. Locate ductwork runs, except as indicated otherwise, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view by locating mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions except as specifically shown. Coordinate layout with suspended ceiling, lighting layouts and similar finished work.

B. Electrical Equipment Spaces: Do not run ductwork through electrical equipment spaces and enclosures.

C. Where ducts pass through interior partitions and floors, conceal space between construction opening and duct or duct-plus-insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2" and seal to prevent sound

transmission.

D. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

E. Support ductwork in manner complying with SMACNA "HVAC Duct Standards - 2nd Edition 1995" hangers and supports section.

3.04 CLEANING AND PROTECTION

A. Clean ductwork internally of dust and debris, unit by unit as it is installed.

B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

3.05 TESTING & BALANCING

Refer to Section 15750 for testing and balancing of fans. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 15841

SECTION 16000

ELECTRICAL

# 1 PART 1 GENERAL

## 1.1 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 exterior meter stack for 37 units, 2 tenants and 1 house.
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.
10. Lightning protection as shown on drawings.

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.

## 1.2 RELATED DOCUMENTS

A. The General Conditions, Supplemental General Conditions and Instructions to Bidders shall apply to this work.

## 1.3 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)
9. International Building Code 2003

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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. Prior to installing wiring, conduct review of each dwelling unit type with Owner, Architect and Engineer to verify locations of all devices and fixtures.

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, bollards, and pad mount transformer.

## 2 PART 2 PRODUCTS

2.1 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.

2.2 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.

2.3 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.

2.4 PANELBOARDS

A. Panelboard cabinets shall be of the dead-front safety type, provided with the size and number of single, double or triple 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'. Comply with ADA reach limits at panels that are accessible to handicapped. 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.

2.5 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 rigid steel conduits (RSC) shall have two coats of bituminous protection.

2.6 CONDUCTORS - WIRE AND CABLE

A. Branch circuit conductors installed in the building shall be type "MC" cable or EMT and wire.

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.

2.7 WIRING DEVICES

A. Switches, receptacles and other utilization devices shall be specification grade, grounding type. Color by Architect.

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.

2.8 WIRING DEVICE PLATES

A. Provide device plates for devices, switches, receptacles, and miscellaneous outlets.

B. Plates shall be plastic to match the installed device. Color by Architect.

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 by 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.

2.13 MECHANICAL SYSTEM CONNECTIONS

A. Connect mechanical equipment as shown on the drawings. Control wiring shall be furnished and installed by the Mechanical Contractor.

2.14 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 grounding shall be by Central Maine Power Company.

C. All conduits (primary and secondary) secondary connections and cables shall be by the Electrical Contractor.

2.15 LOW PROFILE TELEPHONE INTERFACED DOOR ENTRY SECURITY INTERCOM

A. Provide a complete telephone interfaced door entry security intercom system with all necessary modules and power supplies to perform the specified functions.

B. The unit shall be Select Engineered System AdvanTEC as distributed by Norris Inc., call David Gagnon 800-370-3473. It shall include an integral electronic directory capable of storing 250 names and displaying eight 5/8" high fourteen character automatically alphabetized names on the backlit LCD display. It shall also provide a PIN keypad capable of accepting 250 individual 6 digits PIN numbers.

C. The unit shall include two door relays rated at 3A @ 28V, must include multi-level surge protection, operate at temperatures of –4 to 104 degrees Fahrenheit and have a two year limited warranty. Size, shape and appearance of the lobby unit is critical and must be no larger than 15"W x 11"H x 3" deep and be constructed of black factory painted treated aluminum alloy faceplate.

D. The system must be ARL Listed and FCC approved and have the ability to add modules for access control using card, chip or biometric Weigand output and/or Network Interface Card for TCP/IP network interface and/or 1200 Baud modem for remote programming and/or a clock calendar for time/date stamping of events.

E. The equipment supplier must provide minimum of 4 hours training on the use and programming of the system to the building owners. Actual programming of names and numbers shall be by the building owner and all electric locking mechanisms and their related power supplies shall be furnished by the hardware supplier.

2.16 METER STACK

A. Meter stacks shall be Square D "EZ PAK" as shown on the drawings. Exterior rated.

B. Complete meter stack and main breaker by the Electrical Contractor and ringless meters by CMP Co.

2.17 TELEPHONE/DATA

A. Provide and install telephone backboard in data 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 data room tel backboard.

2.18 CABLE TELEVISION

A. Provide and install cabling, jacks and plates inside building where indicated on drawings. Cabling shall terminate on tel backboard in data 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).

2.19 CARBON MONOXIDE DETECTOR

A. Provide carbon monoxide detectors as indicated on drawings.

B. Carbon Monoxide Detectors shall be Macurco #CM13.

C. Annunciation in fire alarm panel is specified under specification section 16721.

## 3 PART 3 EXECUTION

3.1 LICENSE

A. Electrical work shall be installed by persons duly licensed by the Electricians Board of the State of Maine.

3.2 COORDINATION

A. It shall be the responsibility of this contractor to coordinate his work with CMP Co., the Telephone company and CTV company and other trades to insure that his work is terminated is a satisfactory manner.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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, two (2) sets 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 16000

SECTION 16721

FIRE ALARM SYSTEM

## 1 PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Fire alarm control panel.

B. Manual fire alarm stations.

C. Automatic smoke detectors.

D. Fire alarm signaling devices.

E. Auxiliary fire alarm equipment.

F. Battery back-up.

### 1.2 RELATED SECTIONS

A. Section 16000 - Electrical.

### 1.3 REFERENCES

A. NFPA 70 - National Electrical Code, 2005 Edition.

B. NFPA 72 - National Fire Alarm Code, 2002 Edition.

C. International Building Code, 2003 Edition.

D. Americans with Disabilities Act.

### 1.4 SYSTEM DESCRIPTION

A. Fire Detection System: NFPA 72, manual and automatic intelligent reporting, connected to a new Notifier NFS-3030 microprocessor controlled fire alarm system with:

1. Installation of new Notifier NFS-3030 Panel, detection and annunciation throughout the building.

2. Installation of new detection and annunciation devices as shown on the drawings.

3. Connection sprinkler flow and tamper switches.

4. Provide framed passive graphic map adjacent to fire alarm control panel.

5. Create as-built drawings of the new fire alarm system.

6. Fire Alarm test with Portland Fire Department.

7. Connection to smoke evacuation systems in the stair towers.

8. Connection to the elevator control system to comply with all applicable NFPA codes. Coordination with elevator supplier/installer.

1.5 DEFINITIONS

A. Words in the singular shall also mean and include the plural, wherever the context so indicates and words in the plural shall mean the singular, wherever the context so indicates.

B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

C. Wherever the term "provide" is used in the specifications it will mean "furnish" and "install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the specifications.

D. Wherever the term "material" is used in the specifications it will mean any "product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.

E. The terms "approved", or "approval" shall mean the written approval of the Architect.

F. The term "specification" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined therein, except for the drawings.

G. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed" and similar words shall mean the direction, requirement, permission, order, designation or prescription of the Architect. The terms "approved", "acceptable", "satisfactory" and similar words shall mean approved by, acceptable or satisfactory to the Architect. The terms "necessary", "reasonable", "proper", "correct" and similar words shall mean necessary, reasonable, proper or correct in the judgment of the Architect.

H. “Conduit" includes in addition to conduits, all fittings, hubs, hangers and other accessories relative to such conduit.

I. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

J. "Exposed" means not installed underground or "concealed" as defined above.

K. "Fire Alarm Contractor" or "Contractor" refers to the Subcontractor or his Sub-Subcontractors responsible for furnishing and installation of all work indicated on the Fire Alarm drawings and in the Fire Alarm specifications.

L. "Design Professional" shall refer to the Design Professional "Bennett Engineering", "Owner" shall refer to the designated representatives of the project owner.

1.6 SUBMITTALS

A. Submit under provisions of Section 16000.

B. Shop Drawings: Provide layout and system wiring diagram showing each device and wiring connection required. Provide panel drawing showing each internal and external connection. Provide itemized list of equipment, quantities, dimension drawings of all equipment, one line drawing, riser diagram and complete color-coded point-to-point floor

plan and riser wiring diagram. Provide panel logic. Provide initiating device message and address.

1. At the time shop drawings are submitted, submit a complete set of shop drawings to the Fire Department for their record and comment. The contractor shall be responsible for any extra costs required because of the failure to submit shop drawings to the Fire Department at start of construction.

2. Failure to meet the above requirements shall be cause for rejecting the system when submitted.

C. Product Data: Provide complete manufacturer's information including electrical characteristics and connection requirements.

D. Test Reports: Indicate satisfactory completion of required tests and inspections.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

F. As built drawings: This contractor shall supply, at the completion of the installation, complete as built drawings for all existing and new fire detection, audio/visual, and fire alarm control panel, including all changes made as a part of this project and including all other equipment, devices and wiring, whether affected by this job or not. Drawings shall include a point to point wiring diagram of each panel, with panels drawn approximately to scale, showing all modules and internal and external connections as well as floor plan wiring and piping diagrams. All input and output devices, zone wiring, end of line devices, conduit sizes, number of conductors shall be shown.

Where logic is not readily obvious from panel connections, logic matrices shall be provided with narrative descriptions of all activation sequences, shut downs and all other functions performed by the fire alarm system.

This submittal shall be accurate and complete, as required in Section 01001.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01001.

B. Record actual locations of initiating devices, signaling appliances, and end-of-line devices.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 16000.

B. Operation Data: Operating instructions.

C. Maintenance Data: Maintenance schedules and Maintenance and repair procedures.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience, and with service facilities within 60 miles of Project.

B. Installer: Company specializing in installing the products specified in this section with minimum five years documented experience, certified by the State of Maine as a fire alarm installer, and be an authorized manufacturer's representative.

1.10 MAINTENANCE SERVICE

A. Furnish service and maintenance of fire alarm system for one year from Date of Substantial Completion.

1.11 EXTRA MATERIALS

A. Provide three of each type of new automatic smoke detector without base.

1.12 SOFTWARE MODIFICATIONS

A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

B. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

2 PART 2 PRODUCTS

2.1 MANUFACTURER

A. Notifier

2.2 FIRE ALARM CONTROL PANEL

A. The main FACP Central Console shall be a NOTIFIER Model NFS-3030 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, panel modules including initiating circuits, control circuits, and notification appliance circuits, local and remote operator terminals, printers, annunciators, and other system controlled devices.

1. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

a) Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.

b) Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.

c) Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the

corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

d) Visually and audibly annunciate any trouble, supervisory, security or alarm condition on operator's terminals, panel display, and annunciators.

B. Operator Control

1. Acknowledge Switch:

a) Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition. In addition, the FACP shall support Block Acknowledge to allow multiple trouble conditions to be acknowledged with a single depression of this switch.

b) Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

2. Alarm Silence Switch:

a) Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field-programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:

a) The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch:

a) Depression of the System Reset switch shall cause all electronically latched initiating devices to return to their normal condition. Initiating devices shall re-report if active. Active notification appliance circuits shall not silence upon Reset. Systems that de-activate and subsequently re-activate notification appliance circuits shall not be considered equal. All programmed Control-By-Event equations shall be re-evaluated after the reset sequence is complete if the initiating condition has cleared. Non-latching trouble conditions shall not clear and re-report upon reset.

5. Lamp Test:

a) The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

6. Scroll Display Keys:

a) There shall be Scroll Display keys for FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. Depression of the Scroll Display key shall display the next event in the selected queue allowing the operator to view events by.

7. Print Screen:

a) Depression of the PRINT SCREEN switch shall send the information currently displayed on the 640-character display to the printer.

C. System Capacity and General Operation

1. The control panel shall be capable of expansion via up to 10 SLC modules. Each module shall support a maximum of 318 analog/addressable devices for a maximum system capacity of 3180 points. The system shall be capable of 3072 annunciation points per system regardless of the number of addressable devices and shall support up to 96 panel circuits, which may consist of either inputs or outputs.

2. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either the owner or installing company.

3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.

4. The FACP shall be able to provide the following software and hardware features:

a) Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.

b) Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting.

c) Two levels of Pre-alarm indication shall be available at the control panel: alert and action.

d) Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.

e) Action: If programmed for action, and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke

detectors shall automatically activate on action Pre-Alarm level, with general evacuation on alarm level.

f) The system shall support a detector response time to meet real world annunciation requirements of less than 3 seconds.

g) Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.

h) NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meet the requirements of NFPA 72.

i) Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.

j) On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop.

k) History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.

l) Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.

m) The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.

n) Drill: The system shall support means to activate all silenceable fire output circuits in the event of a practice evacuation or "drill". If enabled for local control, the front panel switch shall be held for a minimum of 2 seconds prior to activating the drill function.

o) Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.

p) Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions.

q) Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.

r) Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.

s) Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.

t) Print Functions: The system shall provide means to obtain a variety of reports listing all event, alarm, trouble, supervisory, or security history. Additional reports shall be available for point activation for the last Walk Test performed, detector maintenance report containing the detector maintenance status of each installed addressable detector, all network parameters, all panel settings including broad cast time, event ordering, and block acknowledge, panel timer values for Auto Silence, Silence Inhibit, AC Fail Delay time and if enabled, Proprietary Reminder, and Remote Reminder timers, supervision settings for power supply and printers, all programmed logic equations, all custom action messages, all non-fire and output activations (if pre-programmed for logging) all active points filtered by alarms only, troubles only, supervisory alarms, prealarms, disabled points and activated points all installed points filtered by SLC points, panel circuits, logic zones, annunicators, releasing zones, spal zones, and trouble zones.

u) Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fir alarm type code shall activate an output with a fire alarm type code.

v) Resound based on type for security or supervisory: The system shall indicate a Security alarm when a monitor module point programmed with a security Type Code activates. If silenced alarms exist, a Security alarm will resound the panel sounder. The system shall indicate a Supervisory alarm when a monitor module point programmed with a supervisory Type Code activates. If there are silenced alarms, a Supervisory alarm will resound the panel sounder.

w) Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.

x) Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.

y) Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector to up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no

requirement for sequential addresses on the detectors and the alarm event shall be a result or product of all cooperating detectors chamber readings.

z) Tracking/Latching Duct (ion and photo): The system shall support both tracking and latching duct detectors either ion or photo types.

aa) ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.

bb) NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.

cc) Security Monitor Points: The system shall provide means to monitor any point as a type security.

dd) One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.

ee) Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.

ff) Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm.

gg) Non-Alarm or Supervisory points shall not activate the general alarm zone.

hh) 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.

ii) 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.

jj) 10 trouble equations per device: The system shall provide support for up to 10 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.

kk) Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.

ll) Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone with four abort options to satisfy any local jurisdiction requirements.

mm) Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector or indicating panel module input. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

5. Network Communication

a) The network architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The protocol shall be based on ARCNET or equivalent. The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master-slave relationships at the network level to facilitate network communications. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. Each node/panel shall communicate on the network at a baud

rate of not less than 312 KBPS (kilo bits per second). A node may be an intelligent Fire Alarm Control Panel (FACP), Network Control Station PC (NCS) or Network Control Annunciator (NCA). The network shall be capable of expansion to at least 103 nodes.

b) Each network node address shall be capable of storing Event equations. The event equations shall be used to activate outputs on one network node from inputs on other network nodes.

c) The network shall be capable of communicating via wire or fiber optic medium. A wire network shall include a fail-safe means of isolating the nodes in the unlikely event of complete power loss to a node.

d) network repeater shall be available to increase the twisted-pair distance capability in 3,000 ft. increments. As an option, a repeater shall be available for fiber optics that increases the wire distance in 10 dB increments. A mix (hybrid) fiber/wire network repeater shall also be supported. Systems that have distance limitations, and have no available means to regenerate signals are not suitable substitutes.

e) Fiber Optic Network Communication: The network shall support fiber optics with the following specifications:

Size =62.5 micrometers / 125 micrometers
Type=Multimode, Dual fiber, Plenum rated
Distance=maximum 10 dB total attenuation between network nodes
Connector type=ST

D. Central Microprocessor

1. The Central Processing Unit shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the Central Processing Unit.

2. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.

3. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.

4. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.

5. Consistent with UL864 standards, the CPU and associate equipment are to be protected so that voltage surges or line transients will not affect them.

6. Each peripheral device connected to the CPU shall be continuously scanned for proper operation. Data transmissions between the CPU and peripheral devices shall be reliable and error free. The transmission scheme used shall employ dual transmission or other equivalent error checking techniques.

7. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.

8. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.

9. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

10. The CPU shall provide one high-speed serial connection for support of network communication modules.

11. The CPU shall provide double pole relays for FIRE ALARM SYSTEM TROUBLE, SUPERVISORY, and SECURITY. The SUPERVISORY and SECURITY relays shall provide selection for additional FIRE ALARM contacts. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

E. System Display

1. The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

2. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.

3. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide ten Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, and CPU FAILURE.

4. The system display shall provide a QWERTY style keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

5. The system display shall include the following operator control switches: ACKNOWLEDGE, SIGNAL SILENCE, RESET, DRILL, and LAMP TEST. Additionally, the display interface shall allow scrolling of events by event type including, FIRE ALARM, SECURITY, SUPERVISORY, TROUBLE, and OTHER EVENTS. A PRINT SCREEN button shall be provided for printing the event currently displayed on the 640-character LCD.

F. Network Control Annunciator

1. A network control annunciator shall be provided to display all system intelligent points. The NCA shall be capable of displaying all information for all 200,000 possible points on the network. Network display devices, which are only capable of displaying a subset of network points, shall not be suitable substitutes.

2. The NCA shall include a minimum of 640 characters, backlit by a long life, solid-state LCD display. It shall also include a full QWERTY style keypad with tactile feel. Additionally, the network display shall include ten soft-keys for screen navigation and the ability to scroll events by type. i.e. Fire Alarm, Supervisory Alarm, Trouble, etc.

3. The network control annunciator shall have the ability to display up to eight events in order of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.

4. The NCA shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use. The network shall support a minimum of 103 network control annunciators (not to exceed total node capacity) and shall connect to the network over either a wire or fiber interface.

5. The network control annunciator shall have an event history buffer capable of storing a minimum of 1000 events in non-volatile memory. Additionally, the NCA shall have a fire alarm history buffer capable of storing a minimum of 200 events in non-volatile memory. Systems that do not protect fire alarm events from being overwritten by other events are not suitable substitutes.

6. The NCA shall include two optically isolated, 9600 baud, industry standard EIA-232 ports for UL864 listed printers and CRT's. These peripheral devices shall print or display network activity.

7. The network control annunciator shall include control switches for system wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test. A mechanical means by which the controls switches are "locked out", such as a key, shall be available.

8. The NCA shall include long life LEDs to display Power, Fire Alarm, Pre-Alarm, Security Alarm, System Trouble, Supervisory, Signals Silenced, Disabled Points, Other (non-fire) Events, and CPU Failure.

9. The network control annunciator shall include a Master password and up to nine User passwords. Each password shall be up to eight alpha-numeric characters in length. The Master password shall be authorized to access the programming and alter status menus. Each User password may have different levels of authorization assigned by the Master password.

10. The NCA shall allow editing of labels for all points within the network; control on/off of outputs; enable/disable of all network points; alter detector sensitivity; clear detector verification counters for any analog addressable detector within the network; clear any history log within the network; change the Time/Date settings; initiate a Walk Test.

11. The network control annunciator shall support an optional WindowsTM based program utility. This utility shall allow the user create an NCA database, upload/download an NCA database, and download an upgrade to the NCA executive. To ensure program validity, this utility shall check stored databases for errors. A compare function shall be included to identify differences between databases.

12. For time keeping purposes the NCA shall include a time of day clock.

13. Each NCA shall support up to 32 additional 80 character remote display annunciators for displaying network activity. These "Terminal Mode" displays will mimic the activity appearing on the corresponding NCA.

G. Signaling Line Circuits (SLC)

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159 monitor or control modules.

2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.

3. The Loop Control Module shall provide power and communicate with all intelligent addressable detectors and modules on a single pair of wires. This SLC Loop shall be capable of operating as a NFPA Style 7 (Class A) circuit.

4. The SLC interface board shall be able to drive an NFPA Style 7 twisted shielded circuit up to 12,500 feet in length. The SLC Interface shall also be capable of driving an NFPA Style 7, no twist, no shield circuit up to 3,000 feet in length. In addition, SLC wiring shall meet the listing requirements for it to exit the building or structure. "T"-tapping shall be allowed in either case.

5. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

H. Serial Interfaces

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.

2. One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

3. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

4. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

I. Notification Appliance Circuit (NAC) Module

1. The Notification Appliance Circuit module shall provide four fully supervised Class A (NFPA Style Z) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.

2. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.

3. The module shall not affect other module circuits in any way during a short circuit condition.

4. The module shall provide eight green ON/OFF LEDs and eight yellow trouble LEDs.

5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.

6. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor.

7. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.

8. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

J. Control Relay Module

1. The control relay module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.

2. Each relay circuit shall be capable of being activated (change in state) by any initiating device or from any combination of initiating devices.

3. The relay module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs (indicates disabled status of the relay).

4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.

5. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.

6. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wire.

K. Voice Control Module (speakers)

1. The voice control (speaker circuit) module shall provide four fully supervised Class B (NFPA Style Y) or Class A (NFPA Style Z) NAC speaker circuits. An expansion circuit board shall allow expansion for up to eight circuits per module.

2. Each speaker circuit shall be capable of switching up to 30 watts maximum per circuit or 60 watts per four circuit module.

3. If a short-circuit trouble occurs on one of the circuits, that circuit will not activate on either manual or automatic command.

4. The module shall provide green ON/OFF LEDs and yellow TROUBLE LEDs.

5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.

6. Each voice circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.

7. The voice control module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL Listed for use with up to 12 AWG wire.

8. Each speaker circuit module may be programmed to activate on activation of the All-Call switch and to deactivate upon pressing the signal silence switch.

L. Voice Control Module (Telephone)

1. The voice control module (telephone) shall provide four fully supervised Class A (NFPA Style Z) telephone circuits. An expansion circuit board shall allow expansion to eight circuits per module.

2. The system shall allow a minimum of seven (7) telephones connected simultaneously to the telephone bus at a given time.

3. If a short-circuit trouble occurs on one of the telephone circuits, that circuit will not activate on manual command.

4. The module shall provide eight green ON/OFF/CALL-IN LEDs and eight yellow TROUBLE LEDs. These LEDs will indicate the status of the individual circuits.

5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular telephone circuit on or off or to disable the circuit.

6. Each telephone circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.

7. The telephone module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL-listed for use with up to 12 AWG wire.

8. Telephone circuits shall have a visual indication by zone that a call-in is taking place and have a unique call-in tone.

M. Voice Command Center (VCC)

1. The Voice Command Center (VCC) shall contain equipment required for all audio control, telephone system control, signaling, and supervisory functions. This shall include amplifiers, tone generators, digital voice units, a microphone and a main telephone handset. The voice command center shall be an integral part of the fire alarm system. Systems that require separate, non-integrated voice systems are not considered suitable substitutes.

2. Function: The voice command center equipment shall perform the following functions:

   a) Operate as a supervised single channel or dual channel emergency voice communication system.

b) Provide automatic custom digital recorded voice message and tone generation.

c) Provide a hand held microphone with priority push-to-talk switch.

d) Provide an all-call switch and indicator to quickly activate all speaker circuits.

e) Operate as a two-way emergency telephone system control center.

N. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.

3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

O. Power Supply:

1. The Addressable Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.

2. The Addressable Main Power Supply shall provide 9 amps of power to the CPU, using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.

3. The Addressable Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 25-200 amp-hours within a 48-hour period.

4. The Addressable Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

5. The Addressable Main Power Supply shall be power-limited per 1995 UL864 requirements.

P. Field Charging Power Supply (FCPS): The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60-hour standby.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (Style Z) shall be available for connection to the Notification devices.

3. The FCPS shall include an attractive surface mount backbox.

4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.

5. The FCPS include power limited circuitry, per 1995 UL standards.

Q. Audio Amplifiers:

1. The audio amplifiers will provide audio power (@ 25 Volts RMS) for distribution to the speaker circuits.

2. Multiple audio amplifiers may be mounted in the fire alarm control panel using additional cabinets if necessary.

3. The audio amplifiers shall include an integral power supply, and shall provide the following controls and indicators:

   Normal Audio Level LED
   Incorrect Audio Level LED
   Brownout LED
   Battery Trouble LED
   Amplifier Trouble LED
   Audio Amplifier Gain Adjust

4. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.

5. All terminal blocks for the connection of field wiring shall have a removable plug-in and be hardwired to allow for ease of field wire installation in a cabinet or at a remote location.

6. The amplifier shall include audio input and amplified output supervision, back up input, and automatic switchover to back up (if primary amplifier should fail).

7. Amplifiers shall be backed up in groups (one amplifier backs up several primary amplifiers).

R. Prerecorded Voice - Audio Message Generator

1. The voice communication system shall be capable of transmitting a prerecorded voice message to all speakers in the building, or to any programmed group of speakers.

2. Actuation of any alarm-initiating device shall cause a pre-recorded message to sound over the speakers. The message shall be repeated four times.

3. A built-in microphone shall be provided to allow paging through speaker circuits and shall have priority over the alarm message.

4. The message generator shall provide an interface to allow paging through telephone circuits.

5. The audio message generator shall have the following controls and indicators to allow for proper operator understanding and control.

   Audio Level Normal LED

All Call LED
On-Line LED
Amplifier Trouble LED
Speaker Trouble LED
All Call Switch
Local Speaker Volume Control

6. The prerecorded message shall be stored on a non-volatile read only memory chip. The message shall be up to 24 seconds in length. An optional random access chip shall be available for a field programmable message. This message shall be programmed through the system's microphone or downloaded via a cassette recorder. Systems that utilize prerecorded memory storage other than on ROM type memory chips are not suitable substitutes.

S. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

4. Point Read: The system shall be able to display or print the following point status diagnostic functions:

   a) Device status

   b) Device type

   c) Custom device label

   d) View analog detector values

   e) Device zone assignments

   f) All program parameters

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time,

or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

9. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.

10. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:

    a) Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.

    b) Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.

    c) All devices tested in walk test shall be recorded in the history buffer.

11. Waterflow Operation: An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

12. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

13. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

14. Non-Alarm Input Operation: Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

15. Combo Zone: A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.3 ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.

2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.

3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Pull Station (NBG-12LX)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector (FSP-751)

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Laser Photo Smoke Detector (FSL-751)

1. The intelligent laser photo smoke detector shall be a spot type detector that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.

2. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.

3. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.

4. The laser detector shall not require expensive conduit, special fittings or PVC pipe.

5. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.

6. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.

7. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.

E. Intelligent Thermal Detectors (FST-751)

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Duct Smoke Detector (FSD-751P)

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Dry Contact Monitor Module (FMM-1)

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.

2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

H. Addressable Control Module (FCM-1)

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.

2. The control module NAC to be wired for Style Z (Class A) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.

3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.

4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

I. Addressable Relay Module (FRM-1)

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

J. Isolator Module (ISO-X)

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.4 SIGNALING DEVICES

A. Alarm Strobe/Lights: NFPA 72, Synchronized 15/75, 30 and 60 candela strobe lamp and flasher with red lettered "FIRE" on white lens.

B. Speaker Horns: NFPA 72, surface type fire alarm speaker operating on 25 VRMS and with field selectable output taps from 0.5 to 2.0 Watts. Sound Rating: 84 dB at 10 feet (3M). Frequency response shall be a minimum of 400 HZ to 4000 HZ. The back of each speaker shall be sealed to protect the speaker cone from damage and dust. Provide integral synchronized 15/75, 30 and 60 candela strobe lamp and flasher with red lettered "FIRE" on white lens. Speaker to be tapped at 2 watts.

2.5 PERIPHERAL DEVICES

A. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled as "Emergency Telephone." The cabinets shall be located where shown on drawings.

2. The handset cradle shall have a switch connection so that lifting the handset off of the cradle shall send a signal to the fire command center, which shall audibly and visually indicate its on-line (off-hook) condition.

3. On activating the remote phone, the phone earpiece shall sound a telephone ring signal until the master handset is lifted.

4. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

B. UV/IR Flame Detector: Det-Tronics X5200 combination Ultraviolet/Infrared flame detector with swivel mount.

C. Heat Detector: Notifier HD-600 series, 200 degree fixed temperature heat detector.

D. System Printer: Canon BJ-85C with serial to parallel (2325PS2) adapter for recording of system events and status changes.

E. Manual Pull Station Back Box: Notifier SB-10 surface back box for NBG-12LX.

F. Tabular Annunciator: Space Age tabular annunciator Model XL-8 with 40 blocks, piezo horn, reset, silence and acknowledge key switches. All key switches to be keyed alike to A-135 per Bangor Fire Department.

2.6 BATTERIES AND EXTERNAL CHARGER

A. Battery:

1. Shall be 12 volt, Gell-Cell type.

2. Battery shall have sufficient capacity to power the fire alarm system for not less than sixty hours plus 15 minutes of alarm upon a normal AC power failure.

3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

B. External Battery Charger:

1. Shall be completely automatic, with constant potential charger maintaining the battery fully charged under all service conditions. Charger shall operate from a 120-volt 60-hertz source.

2. Shall be rated for fully charging a completely discharged battery within 48 hours while simultaneously supplying any loads connected to the battery.

3. Shall have protection to prevent discharge through the charger.

4. Shall have protection for overloads and short circuits on both AC and DC sides.

2.7 SEQUENCE OF OPERATION

A. Trouble Sequence of Operation: System or circuit trouble places system in trouble mode, which causes the following system operations:

1. Describe device and location on Liquid Crystal Display at control panel's network annunciator, floor network annunciators and tabular remote annunciator.

2. Manual acknowledge function at fire alarm control panel silences audible trouble alarm; visual alarm is displayed until initiating failure or circuit trouble is cleared.

3. Transmit signal to MAC Center and ATT via existing communicators.

B. Actuation of an initiating device (pull station, heat detector, UV/IR detector, smoke detector, fire pump running, pressure switch or standpipe flow switch) places circuit in alarm mode, which causes the following system operations:

1. Describe device and location on Liquid Crystal Display at control panel's network annunciator, floor network annunciators and tabular remote annunciator.

2. Energize alarm speaker and strobes.

3. Transmit signal to Bangor Fire Department via Master Box.

4. Transmit signal to MAC Center and ATT via existing communicator.

C. Actuation of a duct smoke detector places circuit on alarm mode, which causes the following system operations:

1. Describe device and location on Liquid Crystal Display at control panel's network annunciator, floor network annunciators and tabular remote annunciator.

2. Energize alarm speaker and strobes.

3. Transmit signal to Bangor Fire Department via Master Box.

4. Transmit signal to MAC Center and ATT via existing communicator.

5. Transmit signal to affected HVAC unit for shutdown.

D. Actuation of a tamper switch, low air alarm, pump phase reversal or power failure to the fire pump places circuit on supervisory mode, which causes the following system operations:

1. Describe device and location on Liquid Crystal Display at control panel's network annunciator, floor network annunciators and tabular remote annunciator.

2. Manual acknowledge function at fire alarm control panel silences audible supervisory alarm; visual alarm is displayed until initiating device is returned to normal condition.

3. Transmit signal to MAC Center and ATT via existing communicator.

## 3 PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Wire and conduits shall be installed in accordance with Division 16.

C. Final connections between equipment and wiring devices shall be made under direct supervision of a representative of the fire alarm system manufacturer.

D. Install manual pull stations with operating handle 48 inches above floor.

E. Install audible and visual signal devices 80 inches above floor or 6 inches below ceiling, whichever is lower.

F. Use Plenum rated Non-Power Limited Cable, 16 AWG twisted pair shielded conductors for fire speaker circuits within floors and CIC cable for riser. Install wiring in conduit.

G. Use Plenum rated Non-Power Limited Cable, 16 AWG twisted pair conductors for fire detection circuits within floors and CIC cable for riser. Install wiring in conduit.

H. Use Plenum rated Non-Power Limited Cable, two conductor 14 AWG minimum size for visual annunciation circuits within floors and CIC cable for riser. Install wiring in conduit.

I. Automatic Detector Installation: Conform to NFPA 72 and NFPA 76.

J. Locate control panel, network annunciators and tabular remote annunciator on the building as shown on Drawings.

K. Do not install detectors within five (5) feet of any air diffuser.

L. Install conduit and wiring and make connections to existing local energy master box.

M. Make conduit and wiring connections to existing outside red beacon.

N. Coordinate with Owner fire alarm system shutdowns during the installation period. System must be returned to normal operating condition at the conclusion of the Contractor's work day.

O. Furnish and install building graphic representations on a frame adjacent to the control panel, elevator lobbies and at stairwell entry on each level of the building.

P. Furnish and install nameplates on all devices for address identification, room numbers and column labeling.

Q. Install conduit and wiring and make connections to HVAC units for shutdown by duct smoke detectors.

R. Install conduit and wiring and make connections to existing digital communicators for alarm and trouble signals to MAC Center and ATT.

S. Install conduit and wiring and make connections to elevator controller for elevator recall functions.

T. Install conduit and wiring and make connections to fire pump controller for pump power loss, phase reversal and pump running signals.

U. Install conduit and wiring and make connections to standpipe tamper and flow switches in the basement fire pump room.

V. Install conduit and wiring and make connections to the deluge sprinkler system on the fifth floor for release, low air alarm, pressure switch and tamper switch.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 1.

B. Tests shall be conducted during off hours.

C. All testing shall be done at the expense of the Contractor, who shall furnish the required equipment. Any and all system installation shut downs must be coordinated with the Owner and the Design Professional, both of whom shall be given 10 days notice.

D. Test in accordance with NFPA 72 and local fire department requirements. All tests shall be conducted to the satisfaction of the Design Professional and the Owner.

E. Before the installation shall be considered complete, a test shall be performed to the satisfaction of the Design Professional, the Owner and the Portland Fire Department as follows:

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

2. Ground circuits and verify response of trouble signals.

3. Each device shall be operated, address and location verified.

4. Each input and output circuit shall be opened to verify supervision.

5. Check that polarity has been observed on all polarized alarm devices and auxiliary relays.

6. Operate detection initiating circuit(s). All alarm functions shall occur according to the design specification.

7. All peripheral equipment shall be actuated including local energy master box trip coil, outside strobe, elevator recall, fire pump signals, sprinkler and standpipe signals and HVAC shutdown.

8. Check that all end-of-line resistors have been installed across the detection and alarm indicating circuits where required.

9. The following testing of the control panel primary power source shall be performed:

   a) Verify that the control panel is connected to a dedicated circuit and labeled properly. This panel shall be readily accessible, yet restricted to unauthorized personnel.

   b) A primary power failure shall be tested in accordance with the manufacturer's specification with the system fully operated on standby power.

10. Conduct 50% of test on battery backup.

11. When all work is completed, system shall be returned to its fully operational design condition. The alarm receiving office and all concerned personnel at the facility shall be notified that the fire system test is complete and that the system has been returned to full service condition.

3.3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Division 1.

B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

3.4 DEMONSTRATION

A. Provide systems demonstration under provisions of Division 1.

B. Demonstrate normal and abnormal modes of operation, and required responses to each. Eight (8) hour minimum to be provided in two (2) four (4) hour sessions.

END OF SECTION