

SECTION 15100

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation and perform all operations required to install a complete hot water heating system in the building; together with renovating domestic hot water system in accordance with these specifications and applicable drawings.
 2. Work to be performed shall include, but is not limited to the following:
 - a. Provide and install forced hot water heating and domestic hot water systems in building areas indicated on drawings
 - b. Pipe, valve and fittings
 - c. Hot water specialties
 - d. Circulating pumps
 - e. Baseboard radiation and wall heaters
 - f. Unit ventilator
 - g. Insulation
 - h. Fans and sheetmetal
 - i. Natural gas and piping system
 - j. Temperature control, tests and balance
 - k. Plumbing systems and equipment
 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. Work not by Division 15:
1. Excavation and back fill
 2. Cutting, coring, drilling and patching
 3. Electrical conduit and wiring
 4. Setting of sleeves
 5. Carpenter work such as chases and soffits together with finish painting.
 6. All painting

1.2 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.

1.3 QUALITY ASSURANCE

Work performed shall conform with all Local and State Rules and Regulations, National Fire Protection Association and propane and Natural Gas Board.

1.4 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.

1.5 SHOP DRAWINGS

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

B. Review must be obtained on the following items:

1. Heating Equipment

- Registers, diffusers, and grilles
- Duct access doors
- Volume control dampers (manual and automatic)
- Duct sealant
- Fire dampers and sleeves
- Turning vanes
- Louvers: provide color selector chart
- Fan and accessories
- Wall heaters
- Pumps
- Pipe, valves, unions and flanges for water, gas and drain
- Balancing valves with read-out gauge and pressure tapplings
- Air vents (automatic and manual)
- Air separator
- Relief valves
- Expansion tank and accessories
- Pipe hangers
- Backflow preventer
- Pressure gauges and thermometers
- Triple duty valves

PART 2.-EXECUTION

2.1 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.

2.2 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.

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.

2.5 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.

2.6 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 hot and cold water piping for both 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

1.1 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 DESCRIPTION OF WORK

A. General

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

1.3 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.

E. Manufacturers

One of the following: Certainteed, Owens-Corning or KnauF.

2.2 INTERIOR DOMESTIC HOT AND COLD WATER PIPING

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

2.3 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/finch. 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.

2.4 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.

2.5 CHIMNEY CONNECTORS

Chimney connectors shall be double wall metal as specified in Section 15841, Ductwork and Accessories.

- A. Insulate the following heating piping in thickness, in accordance with Table II following:
Heating hot water supply & return piping

TABLE II
Minimum Pipe Insulation
Heating Thickness for Pipe Sizes*

HEATING SYSTEM	TEMPERATURE RANGE					
	F	Inch	Inch	Inch	Inch	5/8 LARGER Inch
Low Pressure/Temp	201-250	1.0	1.5	1.5	2.0	2.0
Low Temperature	120-200	0.5	1.0	1.0	1.5	1.5

*Pipe sizes are nominal dimensions. For piping exposed to ambient temperatures, increase thickness by 0.5 in.

**Runouts to Individual Terminal Units (not exceeding 12 ft. in length)

3.3 HVAC DUCT SYSTEMS INSULATION

- A. Insulate the following ducts with 1-1/2" thick duct wrap:
1. Ducts outside of building insulation and horizontal duct connections between riser and motor operated damper.
 2. All supply and outside air ducts.

3.4 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.

SECTION 15300

NFPA-13R SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

- A. It is the intent of this specification to provide automatic wet type sprinkler fire protection of Building A, 3 story Garden Apartments (Note: Building B Townhouse Apartments will not be sprinkled) including all areas required to conform to NFPA-13R. Provide freeze protected systems for all areas exposed to ambient air temperatures below 40F.
 - B. Contractor shall prepare hydraulic calculations of the fire protection systems in compliance with NFPA and I.S.O.
- 1.3 RELATED WORK SPECIFIED ELSEWHERE
- A. Painting: Section 09900 - Painting.
 - B. Electrical wiring: Division 16 sections.
 - C. Sleeves and fire-sound sealants: Section 15400- Plumbing.

1.4 CODE COMPLIANCE

- A. NFPA Compliance: Install fire protection systems in accordance with NFPA-13R: "Standard for the Installation of Sprinkler Systems, 1999 Edition", NFPA 14: "Installation of Standpipe and Hose Systems, 1993 Edition", NFPA-13R: "Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height, 1999 Edition" and NFPA 20: "Installation of Stationary Fire Pumps for Fire Protection, 1999 Edition".

1.6 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 2000 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 protective cages or sprinkler heads in Exercise Room.
- E. 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.
- F. All sprinkler piping shall be run concealed except in rooms with ceilings at roof deck.

1.7 WATER SUPPLY

- A. Water supply shall be from municipal water system. Sprinkler Contractor shall test for available fire flow and pressure and report results in writing to Architect. Coordinate tests with Portland Water District subsequent to PWD upgrade of water mains in street.
- B. Extend fire service water supply from a point 5 feet underground outside of the building up through floor into Building A Mechanical Room.

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; buttwelding fittings and welded joints, or mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type.
- C. Comply with requirements of NFPA -13R 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.
- C. Install fire department connection valves in piping where required.
- D. Install paddle water flow indicators.
- E. Install manual shutoff at each audible alarm station.
- F. Install Inspector's test connection at most remote point from riser.

2.4 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 Hiiti or 3-M

2.8 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- 13R.
Furnish wiring requirements to electrical installer for electrical wiring of supervisory switches.

2.9 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 pendant
- Standard dry-type pendant and Standard dry-type upright

Island View Apartments
Portland, Maine

Sprinkler
153007

- B. Manufacturer's Factory Tests: Pump shall be hydrostatically tested and run tested prior to shipment. Pump shall be hydrostatically tested at a pressure of not less than 1 1/2 times the no flow (shut off) head of the pump's maximum diameter impeller plus the maximum allowable suction head but in no case less than 250 PSIG.
 - C. Field Acceptance Test: Field acceptance performance test shall be conducted upon completion of pump installation. Test shall be made by flowing water through calibrated nozzles, approved flow meters or other such accurate devices as may be selected by the authority having jurisdiction. Test shall be conducted as recommended in NFPA 20 by pump manufacturer's representative in presence of authority having jurisdiction and with that authority's final approval and acceptance. Failure to submit documentation of factory and field tests will be cause for equipment rejection.
 - D. Pump shall be double suction horizontal split case design with Class 30 cast iron casing, bronze casing wearing rings, bronze impeller and steel shaft.
 - E. Electric Motor: Pump driver shall be ODD type with 1.15 service factor for operation on 208/60/3 volt service. Motor locked rotor current shall not exceed values stated in NFPA 20. Motor shall be mounted on steel base common to the pump and shall be connected to pump with flexible coupling protected by suitable guard. Fire pump manufacturer shall accurately align pump and motor shafts prior to shipment. After field installation but prior to grouting the base, a millwright or similarly qualified person shall check and verify or correct shaft alignment.
 - F. Electric Motor Controllers: Automatic electric motor controller shall be UL listed and FM approved specifically for fire pump service. Controller shall be designed for across the line type starting. Controller shall be rated for horsepower required for fire pump. Controller shall be capable of interrupting short circuit current at least equal to available short circuit in controller supply circuit.
- Fire pump controller installation requires an interrupting capacity rating of not less than 25K symmetrical at an operating voltage or 208 volts. Controller shall be floor or wall mounted for electrical connection to the motor by the equipment installer.

3.2 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 -13R. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.3 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.

3.4 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.

SECTION 15400

PLUMBING

PART 1 - GENERAL

1.1 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.

1.2 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:

- Water service entrance inside boiler room
- Building sewer piping connections to 5 feet outside building wall
- Hot and cold water piping within building
- Soil, waste, and vent systems
- Floor drains, valves and backflow preventer
- Domestic Water Heaters
- Plumbing fixtures and trim
- Pipe insulation
- Connections to fixtures furnished by Others
- Pipe hangers and supports
- Piping and equipment identification
- Tests

PART 2 - PRODUCTS

2.1 PIPE

A. Soil, Waste, Vent and Condensate.

1. Except for fixture connections, all buried pipe and fittings shall be standard weight cast iron coated bell and spigot or Schedule 40 PVC.
2. All cast iron pipe and fittings shall conform to Commercial Standards CS188-66.
3. Joints shall be firmly packed with oakum and filled with molten lead not less than 1" deep. Lead shall be run in one pouring and shall be caulked tight.

Contractor may elect to substitute neoprene rubber gasket in place of oakum and lead.

4. All piping and fittings not buried shall be Tyler cast iron, no hub, Cispil Standard 301-72 bitumastic coated, or Schedule 40 PVC.
5. All 2" waste piping from sink trap to under floor cast iron and all waste piping, 1-1/2" size and smaller, not buried shall be type "L" hard drawn copper tubing with drainage fittings made up with 50-50 solder. 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.
6. Buried vent piping shall be as specified for Soil and Waste above.
7. Vent piping not buried shall be Schedule 40 PVC pipe and fittings with solvent joints or galvanized steel.

B. Domestic Water Piping

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

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# WOG4G.
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.

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.

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.

Cast iron body flashing collar, sediment bucket, nickel bronze top, 7" diameter, Type B adjustable strainer head, inside caulk: Zurn Z-415 or equal by Josam, Smith or Wade.

2.6 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.

2.7 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.

2.8 SOUND INSULATION

Wrap waste lines over living space ceilings with building insulation.

2.9 THERMOMETERS

Units to be equivalent to Terice No. BX9 series, adjustable angle with 30° to 180° range except 30° to 200° at dishwasher.

2.10 PRESSURE GAUGES

Furnish and install pressure gauges with gauge cocks on piping where shown on drawings. The dial range shall be such that the normal pressure shall be approximately mid-way of dial. Gauges shall be Terice No. 600 or equivalent by Weiss or Nurnburg, 4-1/2" dial size, cast aluminum case, with brass "T" handle cocks and No. 872 bronze pressure snubbers on water units.

- 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:

- 1. **Water Closet**
Sterling by Kohler- Model- 402215, elongated bowl, tank type, 1.6 gallon per flush toilet, floor mounted, white vitreous china. Kohler Windham Model 402315 meets ADA requirements to be installed where indicated on drawings.
 - 2. **Lavatory**
Sterling by Kohler- Model- 442004, Sanibel 4" drop in vitreous china lavatory. Faucet shall be Chateau by Moen- L64621, single handle. ADA compliant where specified on Architectural Drawings.
 - 3. **Tub/Shower**
Aqua Glass- Model- 326032A-RL, white, 60" x 31 ¾" tub/shower unit. ADA compliant where specified on Architectural Drawings. H/C unit shall be Aqua Glass- Model- SC6083 RL, white, which will include 4 grab bars and optional fold down seat. Moen handheld single function spray shower Model- 3817.
Chateau Posi-Temp by Moen- Model- TL1843, single handle tub/shower trim kit.
- 3b. **Shower**
Aqua Glass- Model- 313637AC, white, 35 ½" x 37" unit. Chateau by Moen Model TL182, single handle shower trim kit.

PART 3 - EXECUTION

3.1 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.

3.2 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. Make all joints in copper gas tube with Silvabrite 100 lead-free applied in strict accordance with the manufacturer's recommendations.

3.3 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.

3.4 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.

SECTION 15488

NATURAL GAS

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 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.

1.3 QUALITY COMPLIANCE

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

NFPA Compliance: Comply with applicable provisions of NFPA 54.

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

State of Maine Compliance: Propane and Natural Gas Board Laws and Rules!

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.

- 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

3.1 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

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.

3.7 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.

3.8 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 PIPING SYSTEM AND SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

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

1.2 QUALITY OF COMPLIANCE

A. Piping

1. Welding: Quality 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.

2.2 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

All valves shall be of one manufacturer and by one of the manufacturers listed. 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.

Island View Apartments
Portland, Maine

Hot Water Piping
15510/3

2.3 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:

<u>Pipe Size</u>	<u>Rod Size</u>
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. 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.

2.6 HOT WATER SPECIALTIES

A. Circuit Setters

- 1. Provide circuit setters valves 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 TACO or equal from Bell & Gossett with working pressure of 125 psig and maximum operating temperature of 250°F.

B. Radiator Valves

All radiation shall be provided with ball valves as specified under VALVES.

C. Flow Control Valves

- 1. General: Install automatic pressure compensating balancing flow control valves where indicated on drawings. Valves shall have capacities and pressure differential characteristics as indicated and conform to the following specifications.

E. 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. By-pass type vents shall be installed where shown and as detailed on drawings. By-pass valves shall be plug-type globe as specified under VALVES.

F. Expansion Tank

1. Tank

Furnish and install pressurized diaphragm type hot water expansion tank pre-charged to 12 psi as shown on drawings. Tank shall be constructed of steel for 125 psi working pressure in accordance with ASME Code, and have tapplings for water connections and charging valve. Tank shall be furnished with ASME stamp.

- 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.

G. 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, as well as a strainer.

L. Pressure Gauges

Furnish and install pressure gauges with gauge cocks on piping, where shown on drawings. The dial range shall be such that the normal pressure shall be approximately midway of the dial. Gauges shall be Terrice No. 600 or approved equal by Weiss or Numburg, 4-1/2" dial size, cast aluminum case with brass "T" handle cocks and No. 872 bronze pressure snubbers.

M. Thermometers

Furnish and install where indicated on the drawings, red reading mercury, adjustable angle thermometers with 9" case, stainless steel frame, front double strength glass window, brass separable socket, No. BX914 Series, as manufactured by H.O. Terrice Co., approved equal by Weiss or Numburg.

Temperature Range: Domestic hot water 30°F. - 180°F.

Heating System 30°F. - 240°F.

2.7 PUMPS

A. General

Furnish and install hot water circulating pumps of type, size and capacity shown on drawings.

B. In-Line Pumps

1. Pumps shall be Close Coupled In-Line type, cast-iron and of bronze fitted construction. Pump internals shall be capable of being serviced without disturbing piping connections or motor.
2. Impeller shall be enclosed type, dynamically balanced, keyed to shaft and secured with suitable locknut.
3. Pump seal shall be standard single mechanical seal with carbon seal ring and ceramic (or tungsten carbide) seat. Replaceable shaft sleeve shall be furnished to cover wetted area of shaft under sea or packing.
4. Bearing frame assembly of pump shall be fitted with re-greasable ball bearings equivalent to electric motor bearing standards for quiet operation.

D. Acceptable Manufacturers: One of the following:

1. Taco
2. Bell & Gossett
3. Armstrong

PART 3 - EXECUTION

3.1 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.

3.3 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.

3.4 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.

SECTION 15620

BOILERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of 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. Piping and Specialties: Section 15510, "Hot Water Piping System and Specialties".
 - 2. Electrical: Section 15100, "Mechanical General Requirements" and Division 16 Sections.
 - 3. Insulation: Section 15250, "Mechanical Insulation and Condensate Protection".

1.2 QUALITY OF COMPLIANCE

- A. I=B=R Compliance: Boiler shall be tested and rated in accordance with Institute of Boiler and Radiator Manufacturers (I=B=R) "Testing and Rating Standard for Cast-Iron and Steel Heating Boilers", and bear I=B=R emblem on nameplate affixed to boiler.
- B. ASME Compliance: Construct boilers in accordance with American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code, Section IV.
- C. UL Labels: Provide boiler electrical components that have been listed and labeled by Underwriters Laboratories (UL).
- D. Installation of boilers shall conform to State of Maine Propane and Natural Gas Board: "Laws and Rules".

SECTION 15750

HEATING TERMINAL UNITS

PART 1 - GENERAL

1.1 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.

1.2 QUALITY OF COMPLIANCE

- A. Baseboard Radiation and Wall Heaters: Equipment shall be IBR rated.
- B. Wall Heaters: Motors shall be UL Listed for use.

PART 2 - PRODUCTS

2.1 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.
- B. Baseboard covers shall be and constructed of steel. End covers, inside and outside corners, trim strips, wall sleeve and wall sleeve supports shall be provided.
- C. All baseboard radiation shall be equal to Petite 7.

serve intended purposes.

3.2 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

SECTION 15841

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

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.

1.2 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 2000 HVAC Systems and Equipment, Chapter 16 "Duct Construction", for fabrication and installation of ductwork.
- C. BOCA: Comply with the International Mechanical Code/1998.
- D. NFPA Compliance: NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems", 1999 Edition.
- E. Sheetmetal Work
 - 1. Ducts from Bathroom and Kitchen Exhaust fans to wall or soffit caps.
 - 2. Chimney Connector and Goosenecks.
 - 3. Supply, outside air, return and exhaust ducts.
 - 4. Direct vents at Townhouse boilers.
 - 5. Combustion Air Duct between wall and fan.
 - 6. Furnish all wall and eave caps.

F. Motor Operated Dampers

Motor operated control dampers duct shall be provided and installed by sheetmetal contractor.

G. Fire Dampers

Furnish 2-hour rated Type B fire dampers by LLOYD or equal.

H. Chimney Connector: Double wall by ICC or equal.

I. Diffusers, Registers and Grilles by Titus or equal.

J. Wall and eave caps.

1. Wall caps: Vinyl type in color to match siding. Provide backdraft damper.
2. Eave caps: Equal to Nutone 836-AL with backdraft damper. Provide duct offsets to connect vent.
3. Roof Caps: Equal to Nutone 841-AL with backdraft damper.

PART 3 - EXECUTION

3.1 GENERAL

Assemble and install ductwork in accordance with recognized industry practices to achieve air tight (5% leakage) and noiseless (no objectional 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.

3.2 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 sheetmetal 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.

3.5 BALANCING

Not work of this section. Refer to Section 15880, "Testing and Adjusting (T&A) Work" for air distribution balancing of low pressure ductwork. Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 15841

SECTION 15860

FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Work Included

Furnish and install fans required for work of this section. Provide products of sizes, ratings and characteristics indicated in this section and on drawings.

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

1. Ductwork and Louvers: Section 15841, "Ductwork and Accessories".
2. Electrical: Section 15100, "Mechanical General Requirements" and Division 16.

1.3 QUALITY OF COMPLIANCE

A. Codes and Standards

1. AMCA Compliance: Provide fans bearing AMCA Certified Ratings Seal. Sound rate fans in accordance with AMCA 300 "Test Code for Sound Rating Air Moving Devices".
2. ASHRAE Compliance: Test and rate fans in accordance with ASHRAE 51 (AMCA 210) "Laboratory Methods of Testing Fans for Rating".
3. UL Compliance: Provide fan electrical components which have been listed and labeled by UL.

SECTION 15880

TESTING AND BALANCING

PART 1 - GENERAL

1.1 GENERAL

- A. All reference to Contractor in this Section refers to Testing and Adjusting Contractor unless otherwise indicated.
- B. All Contractors shall be current members in good standing of AABC, NEBB or SMACNA, employing a minimum of one (1) certified T&A supervisor.
- C. Contractor shall keep dust, dirt and debris to absolute minimum and reinstall all removed ceiling tiles to original positions at end of each day, unless Owner has given permission to do otherwise.

1.2 T&A PRELIMINARY REQUIREMENTS

- A. Complete set of approved mechanical-equipment shop drawings shall be obtained from Mechanical Contractor.
- B. Complete set of as-built mechanical drawings shall be provided by Mechanical Contractor.

1.3 SUPERVISION

Certified T&A supervisor shall give personal supervision to all work performed by field technicians, one of whom shall serve as foreman and personal representative to the supervisor.

1.4 T&A INSTRUMENTATION

- 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 standard demanded by these organizations. Copies of current calibration certificates shall be available to Engineer on request.
- C. Flow-measuring hoods (manufactured, not fabricated) will be acceptable for measurement of ceiling diffuser performance only.

1.9 DRIVE ASSEMBLIES

In event that drive assemblies require change in belts and pulleys, or require increase in motor horsepower, Contractor shall:

1. Determine size of replacement equipment
2. Advise Mechanical Contractor of total installation cost
3. Request formal approval for increase in T&A Contract
4. Obtain and install replacement equipment, upon formal authorization from Engineer.

1.10 MANUAL VOLUME DAMPERS

- A. If additional manual volume dampers are required to achieve required system adjustments, Contractor shall notify Mechanical Installer and Engineer of sizes required and location of each. Costs shall be extra to contract
- B. In all cases, air volumes shall be adjusted by means of manual dampers in ductwork, not by integral dampers in terminal outlets or inlets.
- C. Duct damper positions shall be marked with permanent-ink markers or black spray paint after final setting has been made.

1.11 HYDRONIC ADJUSTMENTS

- A. Contractor shall obtain specified gpm requirement through circulating pumps, unit ventilator, wall heaters and radiation by adjustment to specified pressure drop shown on equipment schedules.
- B. Measurement of inlet and outlet pressures shall be made with a needle-stem pressure gauge inserted in test plugs on each piece of equipment.

1.12 T&A DATA FORMS

- A. All field data pertaining to air and hydronic adjustments must be tabulated and submitted on standard forms of AABC, NEBB or SMACNA.
- B. T&A foreman shall sign and date each form in space provided and Supervisor's proof of certification shall accompany final report.

1.13 GUARANTEE

Contractor guarantees that all work was performed under supervision of a supervisor certified in accordance with AABC, NEGG or SMACNA standards and procedures.

SECTION 15991

AUTOMATIC TEMPERATURE CONTROLS (ELECTRIC)

PART 1.-GENERAL

1.1 DESCRIPTION OF WORK

General

1. Furnish and install electrical/electronic temperature controls.
2. Control system shall consist of all valves, damper, damper operators, relays, labor and other accessory equipment; together with electrical control wiring to fulfill intent of ATC specification. Control shall be provided for, but not limited to the following:
 - a. Circulating Pumps with differential pressure control
 - b. Reset water valve and controller for control of heating water temperature
 - c. Interlock gas burners with combustion air damper
 - d. Self-Contained thermostatic control of Radiation and Wall Heaters
 - e. Automatic lead-lag control of boilers including domestic hot water heating (DHW)
 - f. DHW recirculating pump control
 - g. Wall heaters and Unit Ventilator
 - h. Baseboard Radiation

1.2 QUALITY COMPLIANCE

- A. Control system shall be manufactured by Barber Colman, Honeywell, Johnson Control, Siemens.
- B. Control systems shall be installed by trained control mechanics regularly employed in installation and calibration of ATC equipment.
- C. Submittal Brochure

The following shall be submitted for approval:

- a. Control drawings with detailed wiring diagrams, including bill of material and description of operation for all systems.
- b. Panel layouts and name plate lists for all local and central panels.

Island View Apartments
Portland, Maine

ATC (Electric)
15991/1

1.4 WIRING

- A. All 24 Volt wiring for installation of temperature controls shall be by Temperature Control Contractor. Power wiring for 120 Volts or greater equipment shall be by Electrical Contractor.
- B. All wiring shall comply with requirements of Division 16 of the Specification.

PART 2 - PRODUCTS

2.1 THERMOSTATS

- A. Electronic Air Stream Thermostats: Insertion thermostats shall be similar in design to space type thermostats, except temperature sensing element shall be averaging type as required and located in the air stream.
- B. Self-Contained Thermostatic Radiator Valves: Valve bodies shall be horizontal or vertical pattern of nickel plated brass. Valve shall be designed to open or close automatically according to room temperature with controller mounted with valve. Valve shall have all working parts in a cartridge consisting of "O" Rings, seat disc and stainless steel spring. Provide cartridge and removal tool so it can be replaced while under full system pressure. Valve shall conform to ASHRAE Standard 102-1989, "Methods of Testing Nonelectric, Nonpneumatic Thermostatic Radiator Valves".

Thermostatic control shall have remote temperature sensor assembly consisting of wall mounted controller with set point dial with range of 43F to 79F, capillary tube, tube wall clips and remote sensing bulb. Mount controller 5'-0" above floor.
- Self Contained Thermostatic valves and controls shall be by Honeywell-Braukmann or equal from Danfoss.
- C. Low Temperature Safety Thermostat (Freezestat): Electric low temperature warning thermostat shall have low point sensitive elements (not averaging type) installed to cover entire duct area. Thermostat shall be two position type with manual reset. Freezestat shall stop unit ventilator fan and close outside air damper if freezing condition is detected.

2.6 DESCRIPTION OF OPERATION

A. The system shall be hot water supplied from boiler two boilers.

B. Hot Water Control

TEKMAR or HW OA sensor to control system to reset water. Two (2) sensors: one supply and one return.

Above 65 degrees outdoor air temperature the pumps shall be off, below 65 degrees the selected pump shall be on. On a failure of the selected pump, the standby pump shall be started.

C. Boiler Control

Boilers shall be sequenced through Lead-Lag Control Panel specified under Section 15620, Hot Water Boilers.

D. Circulating Pumps

1. Provide pump selector switch and electric relay and locate in area of pumps. Pump selected shall run continuously from flow switch installed in primary pipe main. Magnetic starters with 110 volt control circuit and H-O-A switches shall be provided by the Electrical Contractor.

2. A differential pressure control shall by pass water from supply to turn to maintain pressure setting in piping system.

E. Baseboard Radiation

Baseboard shall be controlled from wall thermostat by opening and closing 2-way control valve.

F. Wall Heaters

Self contained thermostatic valve shall cycle fan ON or OFF to satisfy temperature setting.

G. Unit Ventilator

Occupied

1. When space temperature is below set point of room thermostat, fresh air damper shall be closed and return air damper open fully. As space temperature rises to within throttling range of room thermostat, fresh air damper shall modulate open to minimum outdoor air required for

Part II

Division 16

Electrical

Island View Apartments

Electrical Specification Section 16000

will be

on the Drawings