

- K. Pad Hooks: Stainless steel button type.
 - L. Protective Pads: One set sets, canvas cover, padded, brass grommets.
- 2.4 CAB ENTRANCES
- A. Cab Doors: Painted steel of hollow panel construction, flush design, rolled profiles, rigid construction.
 - B. Cab Door Frames: Stainless steel, welded corner design with smooth invisible joints.
 - C. Thresholds: Extruded aluminum type.

2.5 HOISTWAY ENTRANCES

- A. Hoistway Doors: Painted steel hollow sandwich panel construction, flush design, rolled profiles, rigid construction.
- B. Hoistway Door Frames: Stainless steel of rolled profiles, knocked down design.
- C. Door and Frame Construction: 1-1/2 hour fire rating.
- D. Weatherstrip hoistway doors and frames to minimize audible noise.
- E. Sills: Extruded aluminum . . .
- F. Landing Buttons: Illuminating type, one for originating UP and one for originating DOWN calls, one button only at terminating landings; marked with arrows
- G. Car Position Indicator: Illuminating, one per elevator per floor.
- H. Car Direction Indicators: Illuminating, one per elevator per floor.

2.6 FINISHES

- A. Baked Enamel on Steel: Clean and degrease metal surface; apply one coat of primer sprayed and baked; two coats of enamel sprayed and baked; color as selected.
- B. Stainless Steel: #4 Satin Polished.
- C. Aluminum: Clear anodized finish.

3 PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify that hoistway, pit and machine room are ready for work of this Section.
- B. Verify shaft and openings are of correct size and within tolerances.
- C. Verify that electrical power is available and of the correct characteristics.

4. Applicable seismic design data; certified by a Registered Professional Structural Engineer.
 5. Elevator control functions and operational description.
- B. Product Data: Provide data on the following items:
1. Signal and operating fixtures, operating panels, indicators.
 2. Cab design, dimensions, layout, and components.
 3. Cab and hoistway door and frame details.
- C. Schematic: Provide legible schematic of hydraulic piping and electric wiring diagrams describing installed equipment. Provide one copy of master schematic, mounted in plastic glazed metal frame, mounted on machine room wall.
- D. Samples: Submit two samples, illustrating cab floor material, cab interior finishes, cab and hoistway door and frame finishes.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
1. ASME A17.1 - Safety Code for Elevators and Escalators.
 2. UL 10B - Fire Tests of Door Assemblies.
 3. Americans with Disabilities Act (ADA).

1.6 MAINTENANCE

- A. Include description of elevator system's method of operation, control description, motor control system, cab and hoistway door operation, visual and audio signals, fire fighter's service, and specified non-standard features.
- B. Include a parts catalog with complete list of equipment replacement parts.
- C. Include legible schematic wiring diagrams of installed electrical equipment.
- D. Provide one copy of master hydraulic and electrical schematic and one copy of lubrication chart, each framed with clear plastic glass; mount on machine room wall.

2. PART 2 PRODUCTS

2.1 ELEVATOR SYSTEM AND COMPONENTS

- A. Manufacturers:
1. Canton Elevator
 2. Dover Elevator
 3. Otis Elevator
- B. Structural Components, Cylinder and Casing: Required to construct elevator system and conform to code.
- C. Casing Jacket: PVC.
- D. Sheet Steel: ASTM A366/A366M Class 1.

occupant ventilation. Face and By-pass damper shall modulate towards closed position to coil face. As space temperature continues to rise, face and by-pass dampers shall close to coil face and open to by-pass around heating coil, an subsequently, outside air damper shall modulate to 100% open. Low limit discharge sensor shall prevent unit discharge air temperature from falling below 60F (adjustable).

2. Whenever fan motor is de-energized, outside air damper shall move to closed position and return air damper to full open position.

Unoccupied

1. Room thermostat shall cycle unit to maintain reduced space temperature set point on thermostat. Outside air damper shall remain closed and return air damper fully open.

Freeze Protection:

1. Upon detection of freeze condition, outside air damper shall go to closed position, return air damper to fully open position and bypass air damper to full bypass position.

H. Exhaust Fans

1. EF-1 and EF-2: Control provided by Division 16.
2. EF-3: Provide cooling thermostat set to 85F (adjustable) to turn fan ON if room temperature exceeds setting.
3. EF-4: Fan shall run continuously except if indexed OFF at wall mounted speed switch.
4. EF-5: Fan shall operate from light switch provided by Division 16.
5. EF-6: Fan shall run continuously except if indexed OFF at wall mounted speed switch.

I. Combustion Air:

Interlock combustion air fans CAS-1 and CAS-2 so that boilers operate in sequence and proof of air for combustion is made with alarm for failure of either or both combustion air fans.

END OF SECTION 15991

2.2 RELAYS

Relays shall be furnished and installed as required for the successful operation of the system. Relays handling electric motors shall have sufficient capacity to handle current load.

2.3 VALVES

- A. All valves shall be sized by Temperature Control Contractor and guaranteed to be sufficient size to meet heating needs.
- B. Radiator control valves shall be of compact design and shall have port sizes to provide accurate control of the hot water under all load conditions. Packing gland design shall allow for the repacking under pressure. Radiator valves shall be line size.

2.4 DAMPERS

- A. Control damper shall have frames not less than 2" in width, blades not less than 16 gauge galvanized steel, and shall be adequately braced to form a rigid assembly. No dampers shall have blades more than 6" wide. Damper shall be painted with one coat of lacquer. Modulating dampers shall be proportioning or opposed blade type. Oilite bronze bearings shall be provided at the ends of damper blades.
- B. Damper operator shall be provided with bracket arrangement for location outside of air stream wherever possible. Damper motor shall be sufficient size to operate dampers, including slow opening and fast closing.
- C. Damper shall be provided with edge and jamb seals and felt tipped blades for tight closure.

2.5 CONTROL PANEL

- A. Provide and install pump control panels in Mechanical Room with dust tight gasketed hinged door with enamel finish. All switches, relays and equipment necessary for system operation shall be provided in control panel.
- B. All electric wiring within the panel shall be factory wired to a terminal strip.

- c. Valve and damper schedules showing size, configuration, capacity and location of all equipment.
- d. Product data for all control system components.

D. Instruction and Adjustment

Upon completion of the project, the Temperature Control Contractor shall:

- a. Adjust for use by Owner, all thermostats, controllers, valves, damper operators, and relays provided under this section.
- b. Furnish two (2) instruction manuals covering function and operation of control systems for use of the Owner's operating personnel. A competent technician shall be provided for instruction purposes.

E. Guarantee

Control system shall be guaranteed to be free from original defects in both material and workmanship for a period of one (1) year of normal use and service. This guarantee shall become effective starting the date Architect agrees Owner has begun to receive beneficial use of the system.

1.3 INCIDENTAL WORK BY OTHERS

- A. The following incidental work shall be furnished by the designated Contractor under the supervision of the Control Contractor.
 - 1. Heating Contractor shall:
 - a. Install automatic valves and separable wells that are specified to be supplied by the Control Contractor.
 - b. Furnish and install all necessary valved pressure taps, water, drain and overflow connections and piping.
 - c. Install radiation control valves.
 - 2. Sheet Metal Contractor shall:
 - a. Install all automatic dampers.
 - b. Provide necessary blank-off plates required to install dampers that are smaller than duct size.
 - c. Provide access doors or other approved means of access through ducts for service to control equipment.

1.14 FINAL REQUIREMENT

- A. For a period of one month following submittal of final T&A report, Contractor shall make such adjustments as may be deemed necessary by Owner or Engineer to achieve complete satisfaction in system operation.
- B. Contractor shall submit six (6) copies of certified report to Engineer for approval.

END OF SECTION 15880

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

1.5 T&A PRELIMINARY REQUIREMENTS

Complete set of approved mechanical-equipment shop drawing shall be obtained from Mechanical Contractor.

1.6 T&A PROCEDURES

- A. All T&A work, whether air or hydronic, is to be performed in compliance with the Standard Procedure Manual published by the T&A organization affiliated with Contractor.
- B. Contractor shall submit one (1) copy of Standard Procedure Manual to Engineer.

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

1.8 ADJUSTMENT TOLERANCE

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

| | |
|----------------|------------|
| Supply fans | +5% to 10% |
| Supply grilles | 0% to -10% |
| Heating gpm | 0% to -10% |

B. Manufacturers

Fan model numbers indicated are based on PENN or equal fans by Ilg, ACME, Greenheck or Cook.

PART 2 - PRODUCTS

2.1 CEILING AND INLINE FANS

Ceiling fans shall be ceiling and in-line type as shown. Fan shall be direct drive with integral thermal overload protected motors, centrifugal wheel, backdraft dampers and acoustically insulated housing. Provide solid state speed control and in-line adaptor plates (as needed). Unit shall be constructed to permit access to fan and motor without disturbing ductwork.

2.2 COMBUSTION AIR FANS

Field Controls or approved equal Model CAS-7 Combustion Air System.

PART 3 - EXECUTION

- A. General: Install fans where indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices to ensure that fans comply with requirements and serve intended purposes.
- B. Access: Provide access and service space around and over fans as indicated, but in no case less than that recommended by manufacturer.
- C. Test: Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then re-test to demonstrate compliance. Replace equipment which cannot be satisfactorily corrected.

END OF SECTION 15860

3.3 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.

3.4 CLEANING AND PROTECTION

- A. Clean ductwork internally of dust and debris, unit by unit as it is installed. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
- C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until such time connections are to be completed.

F. Dimensions

1. 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

2.1 DUCTS

- A. Ducts including breeching 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. Flexible Connectors
Furnish and install flexible connections on combustion air supply unit. Connections shall be made from Ventglas neoprene coated glass fabric, as furnished by Ventfabrics, Inc., or equal.
- D. 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.
- E. Duct Access Doors
Hinged insulated access doors with seals shall be provided in duct at motor operated damper.

2.2 WALL HEATERS

Wall heaters shall be installed where shown. Units shall include multiblade centrifugal fans with two-speed direct drive motor, insulated casing, coils of copper tubes with aluminum fins and tamper-proof access door to motor control switch. Provide 4-side overlap on recessed units. Units shall be furnished Beacon-Morris or Myson.

2.3 UNIT VENTILATOR

- A. Furnish and install hot water coil damper controlled unit ventilator where shown on the drawings. Unit shall have heating capacity, minimum outdoor air settings, arrangement and standard CFM ratings listed.
- B. Unit shall be complete with two or more multiblade fans, motors having at least two speeds, control switches with motor overload protection, hot water heating elements, face and bypass dampers, outside air and return air dampers. Louvers shall be a specified under Section 15841, "Low Pressure Ductwork and Accessories".
- C. Unit shall be designed to admit minimum 50% outside air and maximum 100%. Provide two complete sets of throw away type filters: one set to be used during construction and other set installed when project is completed.
- D. Unit shall be provided with separate room air and outdoor air dampers. Room air damper shall be constructed of aluminum and shall be counterbalanced against back pressure, to close by wind pressure to prevent outdoor air from blowing directly into the room. Outdoor air damper shall be two-piece double wall construction with 1/2" thick, 1.5 lbs. density fiberglass insulation sandwiched between welded 20 gal. galvanized steel blades for rigidity and to inhibit corrosion. Outdoor air damper shall be fabricated with 1/2" thick 1.5 lb. density fiberglass insulation on exterior of blades and end partitions. Dampers shall be fitted with blended mohair seals along all sealing edges. Damper bearings shall be made of nylon or other material which does not require lubrication.
- E. Units shall be as manufactured by Trane Company; American Air Filter or approved equal.

PART 3 - EXECUTION

3.1 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

Island View Apartments
Portland, Maine

HVAC Units
15750/2

PART 2 - PRODUCTS

2.1 BOILERS

- A. Building A Garden Apartments: Provide two (2) Teledyne Laars Model PH 1430 gas fired hot water boiler with factory mounted pumps, electronic flame supervision, electronic ignition, ON/OFF switch with indicator light, fused control circuit, motorized modulation, gas train and MightyMatic 3 controls.
- B. Building B Townhouses (Each Apartment): Provide Teledyne Laars gas fired Endurance Model EBP110 with automatic burner modulation, direct venting, hot surface ignition, built-in circulating, built-in breeze protection and safety limit.

PART 3 - EXECUTION

3.1 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.

3.2 ACCESS

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

3.3 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

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

3.5 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.

3.6 IDENTIFICATION

- A. See Section 15100, "Mechanical General Requirements".

END OF SECTION 15510

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. 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.

3.2 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.

5. Pump shall be factory tested, cleaned and painted with one coat of machinery enamel prior to shipment. Installation instructions shall be included with pump at time of shipment.

C. Base Mounted Pumps

1. Pumps shall be frame mounted, end suction 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.
5. Pump and motor shall be mounted on common baseplate of heavy structural steel design with securely welded cross members and open grouting area.

A flexible coupler capable of absorbing torsional vibration shall be employed between pump and motor. Coupler shall be equipped with suitable coupling guard as required to meet OSHA standards.
6. Pump shall be factory tested, cleaned and painted with one coat of machinery enamel prior to shipment. Installation instructions shall be included with pump at time of shipment.
7. Provide suction diffuser at each pump consisting of angle type body with inlet vanes and combination diffuser, strainer, orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within flow stream and shall be removable for cleaning. Orifice cylinder shall be equipped with disposable fine mesh strainer which shall be removed by this Contractor after system start-up. Orifice cylinder shall have free area equal to five times cross section area of pump suction opening. Vane length shall be no less than 2-1/2 times pump connection diameter. Unit shall be provided with gauge tapping and adjustable support foot to carry weight of suction piping.

H. 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.

I. 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.

J. Air Separator

Furnish and install air scoop by TACO or equal by Bell & Gossett.

K. Piping Flexible Connectors

1. Flexible neoprene connectors shall be used on pumps as indicated on drawings. They shall be manufactured of multiple plies of nylon tire cord fabric and neoprene both molded and cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement. Straight connectors shall have two spheres. Connectors up to and including 1-1/2" diameter may have threaded ends. Connectors 2" and larger shall be manufacturer with floating galvanized flanges recessed to lock connector's raised face neoprene flanges. Hoses shall be installed on the equipment side of shut-off valves. Support piping as required.
2. Connectors shall be suitable for hot water application and rated a minimum of 150 psi at 220°F. Flanged equipment shall be directly connected to neoprene elbows in size range 2-1/2" or larger if piping makes 90 degree turn at equipment. All straight through connections shall be made with twin-spheres properly pre-extended, as recommended by manufacturer to prevent additional elongation under pressure.
3. Elbows shall be manufactured by Keflex.

2. Valves shall be factory set and shall automatically limit rate of flow to required engineering capacity within $\pm 5\%$ accuracy over an operating pressure differential of at least 15 times minimum required for control. Control mechanism shall consist of self-contained, open-chamber cartridge assembly with unobstructed flow passages that eliminate accumulation of particles and debris. All internal working parts shall be Type 300 passivated stainless steel. No plated materials are acceptable.
3. Type 300 passivated stainless steel cartridge assembly shall consist of spring-loaded cup. Cup shall be guided at two points and shall utilize full available differential pressure across valve to actuate cup. It shall have a thin orifice plate for self-cleaning of variable inlet ports over full control range. Cartridge must be removable in one piece.
4. Valves shall be available in four pressure differential ranges indicated on drawings, with minimum range requiring less than 2 psig to control flow. Cast-iron valve bodies shall be provided with inlet and outlet tappings suitable for connection of instruments for verification of flow rates, and shall be marked to show direction of flow. Valve bodies shall be rated for use at not less than 150% of system designed operating pressures.
5. Certified performance data for flow control valve shall be available. All flow control valves shall be supplied by a single source responsibility.
6. Each automatic flow control valve shall be furnished with a valve kit consisting of 1/4" x 2" minimum size nipples, quick disconnect valves (to be located outside of insulation) and fittings suitable for use with the measuring instruments specified. Provide a metal identification tag with chain for each installed valve. The tag to be marked with zone identification, valve model number and rated flow in GPM.
7. Flow control valves and instrument shall be warranted for period of five years from date of original sale and equal to those manufactured by Flow Design Inc.

D. Drains

Each downfeed terminal heating unit except for baseboard radiators shall be provided with a drain valve between shut-off valves and heating equipment at lowest point in the piping. Baseboard radiators shall have pet cock type drain in lieu of drain valve. All low points in piping mains shall be provided with drain valves. Drain valves shall be ball valves as specified under VALVES with hose connections.

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.

2.4 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.

2.5 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.

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 bronzes 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 and seals, blow-out proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be larger than so-called "conventional port", and develop CV ratings which satisfy design and service requirements. Rated for 600# WOG.

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

2.1 PIPING

A. Pipe Materials

1. Hot water, drains from A.V. Schedule 40 standard weight black steel ASTM 120
2. Cold water Type "L" hard drawn copper tubing

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

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.

3.6 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.

3.2 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.

3.3 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.

3.4 PIPING TESTS

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

3.5 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.

PART 2 - PRODUCTS

2.1 GAS SERVICE PIPING

- A. All Pipe Sizes: Black steel pipe; Schedule 40; wrought-steel buttwelding 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.

2.2 BUILDING DISTRIBUTION PIPINGS

- 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 buttwelding fittings.

2.3 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.

2.4 SUPPORTS AND ANCHORS

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

3.5 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.

3.7 IDENTIFICATION

See Section 15100, "Mechanical General Requirements".

END OF SECTION 15400

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 P.V.C. 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.

4. Kitchen Sink

Elegante by Moen- Model- 22912, single bowl, 23 gauge stainless steel, 21" x 16" x 6". Faucet shall be Manor by Moen- Model- 67130, single handle with spray and hose. ADA compliant where specified on Architectural Drawings.

5. Service Sink SS-1

Floor mounted 24" x 24" x 10" moulded stone equal to Fiat MSB2124 with mop service accessories.

6. Traps and Stops

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

7. Non-Freeze Hose Bibbs

One each building side Building A and 2 each Townhouse (Building B) front and back by Zurn, Smith, Wade, Woodfords or equal.

8. Garbage Disposal

Provided by others. Provide plumbing services.

9. Dishwasher

Provided by others. Provide plumbing services.

10. Clothes Washer

To be provided by others with water, drain boxes by Symmons or equal. Provided by Plumbing Contractor under this section.

2.17 INDIRECT WATER HEATERS

Furnish SuperStor Indirect Water Heaters.

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 709 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 listed are based on American Standard Products. An equal type and quality of fixture as manufactured by Kohler Manufacturing Company or Elger are acceptable. Exact count of fixtures shall agree with architectural drawings.

2.5 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.

2.3 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.

2.4 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.

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 piping penetrating a fire rated wall or floor shall be cast iron pipe or copper tubing as per NFPA 101, Life Safety Code, 2000 Edition.

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.
 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.

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

1.3 CODES

- A. Work done by this Contractor shall conform to Local and 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.

1.4 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.

1.5 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.

3.5 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.

3.6 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

G. Fittings: Pump manufacturer shall furnish piping accessory items for pump installation which will adapt pump connections to the fire protection system and test connection as follows. Fittings subjected to pump discharge pressure shall be ANSI 125 pound rating.

Fittings subjected to suction pressure shall be ANSI 125 pound rating:

1. Hose valves with caps and chains
 2. Pump casing relief valve
 3. Automatic air release valve
 4. Suction and discharge pressure gauges
- H. Jockey Pump: 1/2 HP, 115/60/1 with pressure switch.
- I. Pump shall be Fairbanks Morse 1800 series or equal by Peerless.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Work shall be started as soon as the general construction permits.
- B. All detail of installation is to be done in a neat and workman-like manner.
- C. Risers are to be plumbed with adjacent construction.
- D. O.S. & Y. gate valves are to be aligned with adjacent walls or partitions to provide maximum clearance.
- E. Contractor shall be responsible for coordinating his work with other trades.
- F. Provide insulation around sprinkler head and on drop and 18" on horizontal pipe for sprinklers in freezer and cooler. Caulk openings for pipe penetrations.

- 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 WALL TYPE SIAMESE CONNECTIONS

Fire Department connection shall be in proximity to Building A Mechanical Room. Coordinate final location with Architect and City of Portland Fire Department.

Provide wall flush type cast brass siamese 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. Siamese Manufacturers - Croker-Standard; Elkhart Brass; or equal.

2.11 FIRE PUMP

- A. General: Pump furnished for fire protection service shall be supplied with specified driver, controls and pump accessory items by pump manufacturer. Pump driver and control shall be Underwriters Laboratories (UL) listed for fire protection service. Pumping equipment shall be installed as recommended in the National Fire Protection Association (NFPA) 20, Standard for installation of Centrifugal Fire Pumps and acceptable to authority having jurisdiction.

2.5 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.

2.6 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.

2.7 METERS AND GAGES

Provide meters and gages in accordance with the following listing:

Pressure gages, 0-250 PSI range.

1.8 INSTALLATION

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

PART 2 - PROTECTION

2.1 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.

2.2 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 -13R 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.

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

1.5 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-13R 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.

- 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.
- L. Omit insulation on ducts where internal insulation or sound absorbing linings have been installed.
- M. Install corner angles on external corners of insulation on ducts in exposed finished spaces before covering with jacketing.
- N. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- O. 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

PART 3 - EXECUTION

3.1 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 in Apartment B Townhouses

TABLE I

Minimum Pipe Insulation
Plumbing Thickness for Pipe Sizes*

| Water Temperatures | Mains and Branches | | | |
|-----------------------|--------------------|----------------------|-------------------|-----------------|
| | Up to 1" Inch | Up to 1-1/4" Inch | 1-1/2"-2" Inch | Over 2" Inch |
| F 170-180 | 0.5 | 1.0 | 1.5 | 2.0 |
| 140-160 | 0.5 | 0.5 | 1.0 | 1.5 |
| 100-130 | 0.5 | 0.5 | 0.5 | 1.0 |

Cold Water: 1-inch all pipe sizes

3.2 HEATING PIPING SYSTEM INSULATION

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

PART 2 - PRODUCTS

2.1 INTERIOR HOT AND COLD WATER PIPING INSULATION

A. Fiberglass Pipe Insulation

Performed heavy density glass fiber insulation snap on type with single seam, vapor barrier and air 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 l.

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.

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".

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.

2.3 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.

2.4 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.

Boilers including burners
Pressure reducing valves
Exterior wall sleeves and accessories
Suction diffusers
Pipe flexible connectors
Pipe and valve markers
Baseboard radiation and unit ventilator
Duct
Pipe fittings
Chimney connector
Temperature Controls

2. Plumbing Equipment

Valves
Pipe hangers
Shock absorbers
Pipe markers
Identification (charts and tags)
Insulation
Mixing Valves
Indirect water heaters

1.6 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.

1.7 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.

C. 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. Temperature Control Panels
Electrical Installer shall run 120 volt circuit to temperature control panels and provide duplex receptacle on or adjacent to panel.
4. Circulating Pumps
Electrical Installer shall provide and wire maintained contact magnetic starters, each with Hand-Off-Automatic switch and disconnect switch.
5. Unit Ventilators and Wall Heaters
Electrical Installer shall wire power to unit through speed switch furnished by unit manufacturer. Automatic Temperature Control Contractor shall wire remote thermostats to control unit.
6. Gas Burners
Electrical Installer shall furnish circuit breakers for wiring to control panels by Gas Burner Contractor.
7. Baseboard
Mechanical Contractor shall wire control valves and thermostats.
8. Plumbing Electrical Work
Electrical Contractor shall provide and wire power for domestic hot water and recirculating pumps.
9. 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, 3 phase, 60 hertz.

