Wecoma Place
PERMIT SET

TABLE OF CONTENTS

July 6, 2022

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLER SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the plumbing work specified in this Division.

B. The requirements of this section apply to the fire suppression system.

C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all design, labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes. Provide all labor and material and perform such other services necessary and reasonably incidental to the design and installation of an automatic sprinkler system for all areas indicated on the Drawings and as required by the Governing Agency.

1.02 QUALITY ASSURANCE

A. Contractor Qualifications:
   1. Established fire protection contractor regularly engaged in the design and installation of automatic fire sprinkler systems.
   2. Employ workers experienced and skilled in this trade.
   3. System Designer: Qualified and certified for the design of fire protection sprinkler systems.

B. Governing Agency: All work in accordance with and accepted by the following hereafter referred to Governing Agencies:
   1. Fire Marshal, State of Oregon.
   2. Fire Marshal, City of Lincoln City.

C. Design Requirements:
   1. Comply with the latest issue of NFPA Standard 13.
   2. Design, lay out and install a hydraulically calculated wet and/or dry pipe system utilizing code approved automatic devices designed particularly for use in this type of system.
   3. Provide hydraulic calculation methods design data information in accordance with Chapter 8, NFPA 13. Include a 10 percent margin of safety for available water pressure and flow rate. Include all friction losses from point of flow test to remote sprinkler area.
   4. Fire Sprinkler Coverage: As required by the Governing Agency and including fire protection of all areas including the following.
      a. Covered decks and patios.
   5. Occupancy Hazard: Occupancy Hazard designation in accordance with the Governing Agency requirements.
   6. Seismic Restraint: Include load calculations for seismic restraints on Drawings.
   7. Revisions to the Contractor's design required by the Governing Agency shall be at the Contractor's expense.

D. Acceptable Manufacturers: All sprinkler specialty material. Victaulic, Central, Reliable, Globe, Star, Viking, Automatic Sprinkler Corp. of America with UL or FM approval for use in automatic sprinkler systems. All materials and equipment suitable for 175 psi working pressure.

E. Field Wiring: It is the intent of these specifications that all systems shall be complete and operable. Refer to all Drawings and specifications, especially the electrical Drawings, to determine voltage, phase, circuit ampacity and number of connections provided. Provide all necessary field wiring and devices from the point of connection indicated on the electrical Drawings. All equipment shall be installed in compliance with the Electrical Code and the equipment’s UL listing. Bring to the attention of the Architect in writing, all conflicts, incompatibilities, and/or discrepancies prior to bid or as soon as discovered.

1.03 WORK OF OTHER CONTRACTS

A. Work under this contract shall be conducted in a manner to allow for the future installations of such equipment or items listed in other sections of this Specification.

1.04 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

1.05 SUBMITTALS

A. Working Drawings:
   1. Prepare fire protection system working Drawing showing locations and types of heads or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. Plans shall be stamped and signed by the responsible designer. Plans shall be completed using CAD.
   2. Provide 3 sets of Drawings showing sprinkler head locations and layout coordinated with architectural ceiling details to the Architect for review prior to submitting details to the Governing Agencies.
   3. Provide 6 sets of Drawings to the Architect to be provided to Insurance Underwriter for approval.
   4. Provide 6 sets of Drawings to designated representatives of the Fire Marshal for approval.
   5. Then provide 6 sets of approved Drawings to the Architect for final review.

B. Submittals:
   1. Sprinkler Heads: Product Data for each type of head.
   2. Alarm flow or pressure switches.
   3. System control valves.
   4. Wet riser check valves.
   5. Dry pipe valves.
   6. Piping materials.
   7. Alarm bell.
   8. Air compressor and air maintenance device.
   9. Miscellaneous Equipment.

C. Test Reports: Submit certificates of completion of tests and inspections.

1.06 EXTRA STOCK

A. Additional Heads: Provide number, type and temperature rating installed as required to meet NFPA 13 requirements.

B. Storage Cabinet: Provide as required to receive reserve sprinkler heads and special installation tools required.

C. Index Label: Provide for each head indicating manufacturer, model, orifice, size or K-factor, and temperature rating. Also provide inside cabinet a list of heads stored within and brief description of where installed.

1.07 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the contractor shall agree to pay for the cost of repair of the reported defect by a contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Miscellaneous Sprinkler Specialties: Complete system including all items required by the Governing Agency including but not limited to:
1. Electric alarm switch and outdoor 120 V alarm bell.
2. Valve monitoring switches with two outputs (one to fire alarm & one to sprinkler alarm bell).
3. Fire department hose connections.
4. Wiring from the alarm switches to the point of connection in the Fire Alarm Control Panel. Coordinate with the Electrical Work specified in Division 28. If no alarm system is specified in Division 28, provide all necessary equipment and wiring for a local alarm system.
5. Provide communication equipment with local fire department when required by Governing Agency.
6. Dry pipe air compressor sized and arranged in accordance with the requirements of NFPA No. 13. Include an automatic air pressure maintenance device.

B. Sprinkler Heads: Approved heads with temperature ratings required for service indicated. Quick response or residential style in accordance with Code requirements and as approved by the Authority having jurisdiction.
1. Unfinished Areas: Upright, pendant or sidewall spray type, plain bronze.
2. Finished Areas: Concealed pendant heads with white cover plate.
3. Dry Pipe Systems: Especially designed and approved for dry pipe systems except where piping is routed through heated areas, standard heads may be utilized as approved by the Governing Agency.
4. Dry pendant or dry sidewall heads for small areas subject to freezing. Chrome plated at interior finished locations and plain bronze in unfinished areas and exterior locations.

C. Escutcheons: Provide polished chrome escutcheons on pipe extending through finished walls and ceilings. Provide oversized escutcheon to comply with current code.

D. Underground Water Piping: Ductile cast iron water pipe; ANSI A-21.51; with mechanical joints, ANSI A-21.10 and ANSI A21.11; and with concrete thrust blocks.

E. Above Ground Water Piping: Use standard weight (schedule 40) black steel pipe ASTM A53, A135, or A795, and cast iron screwed or mechanical joint fittings especially adapted and approved for sprinkler work. Use reducing fittings where changes in pipe size occur. Bushings are prohibited.

F. At Contractor's option, Schedule 10 black steel pipe ASTM A135 or ASTM A795, and mechanical joint fittings specifically approved for sprinkler use, may be substituted for the black steel pipe specified above. Pipe shall be UL listed and FM approved for 300 psi working pressure. Pipe must have a CRR of 1.00 or greater.

G. At Contractor's option, and in accordance with Code, approved plastic piping systems may be used.

H. Valves: UL and/or FM listed for fire protection service.
1. Iron body OS&Y pattern, bronze mounted double disc, parallel seat.
2. Iron body butterfly style with EPDM liner, bronze disc with indicating type gear operator.
3. Bronze body ball valve, three-piece design, with approved operator.
4. Where required by Governing Agency, provide wall or post style indicating valves.

I. Valve Monitoring Switches: Provide approved monitoring switches where shown on the Drawings or required by Governing Agency.

J. Guards: Standard manufacture.

PART 3 EXECUTION

3.01 INSTALLATION

A. Connect to water supply source as shown on Drawings, check adequacy, and call any deficiency to attention of Architect. Coordinate with work in Division 22 and 33.

B. Install all piping in a true and even manner with lines pitched for drainage and system arranged so that it can be entirely emptied of water. Install hangers at all branch line connections to cross mains and at all other points as required in hereinbefore specified Underwriters Laboratories, Inc. and NFPA standards.

C. Support all pipe work from building construction with mild steel hangers spaced not more than 12 feet on centers. Support mains independently of branches, and in no case shall branch hangers assume any portion of the weight of mains. Provide seismic restraints and flexible connections in accordance with building code requirements.

D. Locate sprinkler heads accurately coordinated with ceiling and lighting fixtures. Conceal all piping unless indicated otherwise.

E. Locate and install the required fire sprinkler alarm, flow, and test and drain valves where required by the Governing Agency.

F. Where sprinkler lines penetrate fire rated partitions, provide fire stopping system in accordance with Section 22 05 00.

3.02 TEST

A. Test all pipes to a hydrostatic pressure of 200 psi and maintain for four hours minimum. Perform other tests as directed by Governing Agency.

3.03 CERTIFICATE OF COMPLETION

A. Obtain and deliver to Owner a certificate, in duplicate, stating that system as installed has been inspected and accepted by authorities and/or agencies having jurisdiction, and that all regulations affecting work have been satisfied. Submit an acceptable certificate to the Owner before final payment is requested.

B. Certificate: Minimum NFPA Figure 16-1 information per NFPA 13.

END OF SECTION 21 13 00

This page intentionally left blank

SECTION 22 05 00
PLUMBING MATERIALS AND METHODS

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the plumbing work specified in this Division.

B. The requirements of this Section apply to the plumbing systems specified in these Specifications and in other Division 22 sections.

C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes.

D. The work shall include, but not be limited to, the following systems:
   1. Water and sanitary sewer service complete per serving utility company requirements.
   2. Service and distribution piping including valves, supports, insulation, etc.
   3. Complete plumbing systems, including fixtures, trim, equipment, etc.
   4. Rough-in and final connection of plumbing equipment and fixtures furnished under other Divisions of this Specification.
   5. Special systems as specified herein.

E. Advise subcontractor, suppliers, and vendors involved in the work specified in this Section of the applicable requirements.

1.02 QUALITY ASSURANCE

A. All work and materials shall conform to all applicable local and state codes and all federal, state and other applicable laws and regulations. All clarifications and modifications which have been cleared with appropriate authorities are listed under the applicable sections. All electrical products shall bear the label of a recognized testing laboratory such as UL or CSA.

B. Whenever the requirements of the Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

C. Codes and Standards: Comply with the provisions of the following referenced codes, standards and specifications:
   1. Federal Specifications (FS)
   2. American National Standards Institute (ANSI)
   3. National Electrical Manufacturer's Association (NEMA)
   4. National Fire Protection Association (NFPA)
   5. Underwriters Laboratories, Inc. (UL)
   6. Factory Mutual (FM)
   7. International Building Code (IBC) with State and Local Amendments
   8. International Mechanical Code (IMC) with State and Local Amendments
   9. Uniform Plumbing Code (UPC) with State and Local Amendments
   10. Oregon Zero Energy Ready Commercial Code
   11. American Society for Testing and Materials (ASTM)
   12. Americans with Disabilities Act (ADA)
   13. International Fire Code (IFC) with State and Local Amendments
   14. Energy Policy Act (EPAct)
   15. Manufacturers Standardization Society (MSS)
   16. National Sanitation Foundation (NSF)
   17. American Gas Association (AGA)

D. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name. Where two or more units of the same class of equipment are furnished, use product of the same manufacturer; component parts of the entire system need not be products of same manufacturer. Furnish all materials and equipment, new and free from defect and of size, make, type and quality herein specified or approved by the Architect. All materials shall be installed in a neat and professional manner.

E. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

F. The Drawings and Specifications are complementary. What is called for by one shall be as though called for by both.

G. Drawings: Do not scale Drawings for roughing-in measurements, nor use as shop drawings. Make field measurements and prepare shop Drawings as required. Coordinate work with shop drawings of other specification divisions.

H. Field Wiring: It is the intent of these specifications that all systems shall be complete and operable. Refer to all Drawings and specifications, especially the electrical Drawings, to determine voltage, phase, circuit ampacity and number of connections provided. Provide all necessary field wiring and devices from the point of connection indicated on the electrical drawings. All equipment shall be installed in compliance with the Electrical Code and the equipment's UL listing. Bring to the attention of the Architect in writing, all conflicts, incompatibilities, and/or discrepancies prior to bid or as soon as discovered.

1.03 WORK OF OTHER CONTRACTS

A. Work under this contract shall be conducted in a manner to allow for the future installations of such equipment or items listed in other sections of this Specification.

1.04 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. HVAC piping systems, fuel piping systems, fire suppression piping systems, and control devices and control wiring relating to the heating and air conditioning systems are specified under other Divisions of these Specifications except for provisions or items specifically noted on the Drawings or specified herein.

C. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

D. All sections of Division 22 are interrelated and shall be considered in their entirety when interpreting any material, method, or direction listed in any section of Division 22. Individual sections are not written for specific subcontractors or suppliers but for the general contractor.

1.05 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES (SUBMITTALS)

A. Submit in accordance with Division 1 full technical and descriptive shop drawing data on proposed materials and equipment as detailed in each section.

B. The Contractor shall verify that all equipment submitted can be delivered and installed within the time constraints of the construction period.

C. Include the manufacturer, type, style, catalog number, complete specification, certified dimensions, and description of physical appearance for each item and option submitted. Reproduction of catalog data sheets shall be clean and legible to show all details, including gauge of metal used.

D. Include only information on exact equipment to be installed, not general catalogs of the manufacturer. Where sheets show proposed equipment as well as other equipment, identify proposed equipment with rubber stamp arrow or similar concise method.

E. Submit with each copy a transmittal letter verifying that all included equipment submittals have been carefully considered for quality, dimensions, function, and have been coordinated with the Drawings and Specifications. Guarantee that proposed materials will meet or exceed the quality and function of those specified.

F. Include field wiring diagrams and connection diagrams for all control and/or low voltage systems, including floor plans.

G. Submittal Review: The submittal review process is a means to provide quality control. The action noted to be taken (or where conflicts with the contract documents are not noted) shall not be interpreted by the Contractor as automatic "change orders." Approval of the data for substitution and shop drawings shall not eliminate the contractor’s responsibility for compliance with Drawings or Specifications, nor shall it eliminate the responsibility for freedom from errors of any sort in the data discovered prior to or after the review process. Deviations, discrepancies, and conflicts between the submittals and the Contract Documents shall be called to the Architect's attention in writing at the time of transmittal of the data.

H. Unless otherwise directed by Division 1, submittal data shall be in a 3-ring plastic binder with a clear plastic sleeve and a project identification sheet inserted. Arrange submittals numerically with specification sections identified on divider tabs. All required sections shall be submitted at one time.

1.06 PRODUCT SUBSTITUTION

A. Materials other than those specified may be approved for this project providing a written request is submitted to the Architect prior to bid in accordance with Instructions to Bidders. Requests shall include complete specifications, dimensions, manufacturer and catalog number for each item for which approval is desired. If, in the opinion of the Architect, the material is not complete or if it is not an acceptable substitute, he may reject it. The Architect's evaluation will be based solely on the material submitted.

1.07 CHANGE ORDERS

A. All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labor and materials without exception. At the Architect's request, the contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

1.08 RECORD DOCUMENTS

A. Project Record (As-Installed) Drawings:
   1. Maintain a set of record drawings on the job site as directed in Division 1.
   2. Keep Drawings clean, undamaged, and up to date.
   3. Record and accurately indicate the following:
      a. Depths, sizes, and locations of all buried and concealed piping and all cleanouts, whether concealed or exposed, dimensioned from permanent building features.
      b. Locations of all valves.
      c. Changes, additions, and revisions due to change orders, obstructions, etc. Eradicate extraneous information.
      d. Locations of tracer wire terminal points.
      e. Model numbers of installed equipment.

4. Make Drawings available when requested by Architect for review.
5. Submit as part of the required Project Closeout documents.

B. Operating and Maintenance Manuals: Submit five (5) sets of Operating and Maintenance Instructions, including manufacturer's service data, wiring diagrams, and parts lists and vendors for all serviceable items of equipment, valve charts, balancing data, final control diagrams showing final set points, and any additional equipment added by change order, bound in three-ring, vinyl or canvas covered, loose-leaf binders organized with index and thumb-tab markers for each classification of equipment or data.

1.09 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the contractor shall agree to pay for the cost of repair of the reported defect by a contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 GENERAL

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of two years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Compatibility: Provide products which are compatible with other portions of the work and provide products with the proper or correct power and fuel-burning characteristics, and similar adaptations for the project.

C. Efficiency: Service (Domestic) Water Heating Equipment shall comply with the State Energy code. Where equipment efficiencies are indicated, the use of alternate or substitute manufacturer’s equipment with lower efficiencies is not permitted.

D. Storage and Handling:
1. Delivery: Deliver to project site with manufacturer's labels intact and legible.
2. Handling: Avoid damage.
3. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

2.02 VALVES

A. General: Provide factory fabricated valves of the type, body material, temperature and pressure class, and service indicated. Bronze gate, globe and check valves shall comply with MSS-SP-80. Ball valves shall comply with MSS-SP-110. Iron gate and globe valves shall comply with MSS-SP-70. Iron check valves shall comply with MSS-SP-71. Butterfly valves shall comply with MSS-SP-67. Valve size same as connecting pipe size.

B. Acceptable Manufacturers: Milwaukee, Crane, Grinnell, Nibco, Hammond, Stockham, Legend, Watts, FNW, and Walworth. NIBCO numbers are given except as noted. Where possible, provide valves from a single manufacturer.

C. Valve styles: Domestic hot and cold water.
1. Valves 2” and Smaller:
a. Ball: Two-piece, DZR brass body, full port, 600 psi WOG, Fig. T/S-585-70.

b. Check: Bronze body, swing check, 200 psi WOG, T/S-413B (bronze disc) or T/S-413Y (Teflon disc).

D. Selection of Valve Ends (Pipe Connections): Select and install valves with ends matching the types of pipe/tube connections.

2.03 HANGERS AND SUPPORTS

A. General: Provide factory-fabricated horizontal piping hangers, clamps, hanger rod, inserts, supports, etc., of the indicated MSS type and size. The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry Practice SP-58 and SP-69 are referenced in this section.

B. Manufacturers: B-Line, Carpenter & Paterson, Grinnell, Michigan, Superstrut, Tolco, Erico, or accepted substitute. Grinnell figure numbers in parentheses where applicable (or other manufacturers as noted).

C. Corrosion Protection: Provide materials which are zinc plated or factory painted to prevent corrosion. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, plastic coated, or by other recognized industry methods.

2.04 PENETRATION FIRE STOPPING

A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories. 3M, Metacaulk, SpecSeal, or approved.

B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, roughing-in dimensions and equipment locations before proceeding with any of the work.

B. Sleeves, Inserts, Cast-in-Place Work: Provide sleeves, inserts, anchoring devices, cast-in-place work, etc. which must be set in concrete sequenced at the proper time for the project schedule.

C. Coordination:
1. The Drawings are based on equipment of a certain manufacturer and may be identified as such. Where alternate manufacturers or approved substitutes are incorporated into the work, any required design changes are the responsibility of the contractor. Such changes may include changes in utility or system connection sizes, location, or orientation, service clearances, structural support or acoustic considerations.
2. Where the work must be sequenced and positioned with precision in order to fit into the available space, prepare accurate scale shop Drawings showing the actual physical dimensions required for the installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.
3. Cooperate with other trades in furnishing material and information for sleeves, bucks, chases, mountings, backing, foundations and wiring required for installation of mechanical items.
4. Coordinate all work with other trades and determine in advance where interfacing of the mechanical work and other work are required to be connected together. Provide all materials and equipment to make those connections. Submit shop Drawings showing required connections where special conditions exist.

D. Discrepancies: Report immediately any error, conflict or discrepancy in Plans, Specifications and/or existing conditions. Do not proceed with any questionable items of work until clarification

of same has been made. Should rearrangement or re-routing of piping be necessary, provide for approval the simplest layout possible for that particular portion of the work.

3.02 UTILITY COORDINATION

A. Utility Coordination: Coordinate all aspects of the incoming plumbing utility services indicated with the city engineer, serving utility, and the off-street improvements contractor. Requirements of the utility company which exceed the provisions made on the Drawings or covered by these Specifications shall take precedence. Provisions made on the Drawings or Specifications in excess of the utility company's requirements shall take precedence. No additional compensation will be allowed the contractor for connection fees or additional work or equipment not covered in the Drawings or Specifications which are a result of policies of the serving utilities.

3.03 MECHANICAL EQUIPMENT WIRING

A. Provide all mechanical equipment motors, automatic temperature, limit, float and similar control devices required, with wiring complete from power source indicated on Electrical Drawings.

B. Provide properly rated motor overload and undervoltage protection and all manual or automatic motor operating devices for all mechanical equipment.

C. Equipment and systems shown on the Drawings and/or specified, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system including controls for the actual selected equipment/system.

3.04 GENERAL INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes, Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain adequate clearances for repair and service to all equipment and comply with Code requirements.

B. Arrangement: Arrange rigid piping parallel with primary lines of the building construction, and with a minimum of 7' overhead clearance in all areas where possible. Unless indicated otherwise, conceal all piping. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance. Give right-of-way to piping which must slope for drainage. Set all equipment level or as recommended by manufacturer. Under no conditions shall beams, girders, footings or columns be cut for mechanical items. Casting of pipes into concrete is prohibited unless so shown on Drawings.

C. Drip Pans: Provide drip pans under all domestic hot water heaters. Provide 3/4" drainage piping, properly discharged to over floor drain or as shown on the Drawings.

D. Access Panels: Provide access panels with proper backing reinforcement for all equipment, dielectric unions, valves and items requiring service and installed above ceilings, behind walls, or in furring, complete with correct frame for type of building construction involved. Exact size, number and location of access panels are not necessarily shown on Drawings. Use no panel smaller than 12" by 12" for simple manual access or smaller than 16" x 20" where personnel must pass through.

E. Adjusting: Adjust and calibrate all automatic mechanical equipment, mixing valves, flush valves, float devices, etc. Adjust flow rates at each piece of equipment or fixture.

F. Building Vapor Barrier: Wherever the building insulation vapor barrier is penetrated by piping, hangers, conduits, etc., provide clear self-adhesive tape recommended by the insulation manufacturer around the penetrations.

3.05 VALVE INSTALLATION

A. General: Comply with the following requirements:

1. Install valves where required for proper operation of piping and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping, and where shown on the drawings. Install valves at low points in piping systems that must be drained for service or freeze protection.
2. Locate valves in accessible spaces (or behind access panels) and so that separate support can be provided when necessary.
3. Install valves with stems pointed up, in the vertical position where possible, but in no case with stems pointed downward from a horizontal plane.

B. Valve Access: Provide access panels to all valves installed behind walls, in furring or otherwise inaccessible.

3.06 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Proceed with the installation of hangers, supports and anchors only after the required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) the proper placement of inserts, anchors and other building structural attachments.
1. Install hangers, supports, clamps, and attachments to support piping and equipment properly from the building structure. Use no wire or perforated metal strap to support piping, and no supports from other piping or equipment. For exposed continuous pipe runs, install hangers and supports of the same type and style as installed for adjacent similar piping.
2. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated or by other recognized industry methods.
3. Support piping independently of fire sprinkler piping.
4. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at panel points only.

B. Provisions for Movement:
1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units.
2. Install hangers and supports so that equipment and piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Install hangers and supports to provide the indicated pipe slopes.

C. Pipe Support:
1. Vertical Spacing: Support at base, at equivalent of every floor height (maximum 10' as required by Code) and just below roof line.
2. Screwed or Welded Steel or Copper Piping: Maximum hanger spacing shall be as follows:

	Steel	Copper
1-1/4" and smaller	7' span	6' span
1-1/2" pipe	9' span	6' span
2" pipe	10' span	10' span
2-1/2" & larger	12' span	10' span

3. PVC, ABS and Other Rigid Plastic Pipe: Maximum hanger spacing and minimum rod diameters as follows:
   a. Continuous support 1/2" to 4" pipe size Fee & Mason No. 109 channels with Fee & Mason No. 108 hanger. Lay pipe directly into the channel with fittings or couplings placed in spaces between channel sections. Secure piping to the channel at intervals between hangers with a few turns of vinyl electrical tape.
   b. Non-Continuous Support: Maximum 4' spans or shorter if required by manufacturer for temperatures and pipe schedule.
   c. Arrange supports to allow free movement, but restrict upward movement of lateral runs so as not to create reverse grade on drainage pipe. Use double bolt clamp or band hanger with restraint (Tolco fig. 25).
4. PEX and Other Flexible Plastic Pipe:

a. Continuous support: As specified above or in exposed locations may be supported within EMT tubing supported as specified for steel pipe.
b. Non-continuous support: Maximum 32” spans in concealed locations.

5. Install additional hangers or supports at concentrated loads such as pumps, valves, etc. to maintain alignment and prevent sagging.
6. Support Rod: Hanger support rods sized as follows:

Pipe and Tube Size		Rod Size	
Inches	mm	Inches	mm
1/2” to 4”	12.7 to 101.6	3/8”	9.5
5” to 8”	127.0 to 203.2	1/2”	12.7
10” to 12”	254.0 to 304.8	5/8”	15.9

D. Adjust hangers and supports to bring piping to proper levels and elevations.

E. Provide all necessary structural attachments such as anchors, beam clamps, hanger flanges and brackets in accordance with MSS SP-69. Attachments to beams and joists wherever possible. Supports suspended from other piping, equipment, floor sheating, etc., are not acceptable.

F. Horizontal banks of piping may be supported on common steel channel member spaced not more than the shortest allowable span required on the individual pipe. Maintain piping at its relative lateral position using clamps or clips. Allow lines subject to thermal expansion to roll axially or slide. Size channel struts for piping weights.

G. Installation of drilled-in concrete anchors shall comply with the manufacturers instructions for working load, depth of embedment, and spacing between anchors and from the edge of the slab. Use only wedge style anchors.

3.07 EQUIPMENT CONNECTIONS

A. Provide complete plumbing connections for all items of equipment requiring such connections, including incidental piping, fittings, trim and labor necessary for a finished working installation.

B. Verify the rough-in and finish requirements for all equipment provided under other Divisions of the work and requiring plumbing connections with equipment supplier and installer prior to rough-in. Minimum branch pipe size for fixtures shall be 1/2". Final piping connection to fixture stops shall be made using metal pipe or tube.

3.08 PROTECTION

A. Protect all work and materials against loss or damage. Close all pipe openings with caps or plugs. At final completion, thoroughly clean and deliver all work and equipment in an unblemished new condition. Keep all motors and bearings in watertight and dustproof covers during entire course of installation.

3.09 PIPE PENETRATION FIRE STOPPING

A. Install as recommended by manufacturer and in accordance with the product’s UL listing. Below are the minimum installation requirements.
1. Install specified penetrating item(s) with required annular spacing in proper size wall or floor opening. Support penetrating item(s) adequately on both sides of construction.
2. Clean all opening and penetrating item surfaces in penetration area to remove loose debris, dirt, oil, wax, grease, old caulking, etc.
3. If needed or required for gypsum or concrete block walls, install specified galvanized steel wire mesh or sleeve recessed and centered inside wall around penetrating item(s) so that it is snug against perimeter of opening.
4. When required, install specified type and depth of backing material in annular space, recessed to required fill depth of fire stopping caulking.
5. Gun, trowel, and/or pump fire stopping sealant to specified depth in annular space around penetrating item(s). Trowel sealant surfaces flush with wall or floor surfaces to a smooth,

defect-free finish. Where required, apply specified size caulking bead around penetrating item(s) at zero annular contact areas and tool smooth.

3.10 PLUMBING WORK CLOSEOUT

A. General: Refer to the Division 1 sections for general closeout requirements. Calibrate all equipment requiring same. Complete each system as shown or specified herein and place in operation except where only roughing-in or partial systems are called for. Each system shall be tested and left in proper operation free of leaks, obstructions, or contamination.

B. Record Drawings: Submit record set of drawings as previously specified in this Section.

C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Architect present, and with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.

D. Operating Instructions: Conduct a walk-through instruction seminar for the Owner's personnel who are to be involved in the continued operation and maintenance of plumbing equipment and systems. Provide written instructions outlining and explaining the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar features of the systems.

END OF SECTION 22 05 00

This page intentionally left blank

SECTION 22 07 00
PLUMBING INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the insulation of plumbing systems specified elsewhere in these specifications.

B. The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Minimum Insulation Thickness and Thermal Performance: Comply with Chapter 13 provisions of the State of Oregon Structural Specialty Code.

1.03 SUBMITTALS

A. Submit catalog data and performance characteristics for each product specified.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to the requirements specified in Section 22 05 00, the following apply:
   1. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Insulation Manufacturers: Armstrong, Imcoa or Nomaco.

2.02 PIPING INSULATION

A. Pipe Temperatures Minus 30 to 180 Deg. F: Flexible, preformed, pre-slit, self-sealing elastomeric pipe insulation up to 2-1/8" ID, thermal conductivity of 0.27 BTU/hr. sq. ft./in. at 75 deg. F and vapor transmission rating of 0.2 perms/inch. Armstrong "Armaflex 2000" or, in concealed locations, Imcoa or Nomaco also approved.

PART 3 EXECUTION

3.01 PIPING INSULATION

A. General: Installation shall comply with the manufacturer’s recommendation with joints and seams completely sealed.

B. Domestic Water Piping:
   1. Insulate with pipe covering, 1” thick for 3/4" and larger hot water piping.
   2. Insulate all water piping exposed to outside weather and freezing temperatures with 1” thickness pipe covering.
   3. Piping required to be insulated by the referenced energy code.

C. Pipe Fittings: Insulate and finish all fittings including valve bodies and unions, with precut insulation sealed to adjacent insulation jacket for continuous vapor barrier covering over all fittings.

END OF SECTION 22 07 00

This page intentionally left blank

SECTION 22 10 00
PLUMBING PIPING AND PUMPS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide pipe, pipe fittings, piping specialties, pumps and related items required for complete piping system.

B. Related Work: The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. General: ASTM, and ANSI Standards are indicated. In addition, special standards are referenced where neither ASTM nor ANSI Standards are applicable.

B. Labeling: All piping shall be continuously and legibly labeled on each length as required by codes and standards and including as a minimum, country of origin, manufacturer's identification marking, wall thickness designation, and applicable standards and approvals. Fittings shall be labeled as required by the referenced standard. Tubular fixture traps shall be stamped with manufacturer's mark and material thickness.

C. Potable Water Valves: Potable water piping materials not limited to faucets, mixing valves, shutoff valves, or pressure reducing valves. Valves shall meet NSF Standard 61, Section 9, for drinking water faucets and shall be brass construction. Brass components which contact water within the faucet shall be from brass which contains no more than 3 percent lead by dry weight.

D. Definitions: Where piping fluid is not indicated in the following paragraphs, provide similar piping materials for similar fluids (i.e., "make-up water" = "domestic water"; "wet stand pipe" = "fire sprinkler pipe"; "drainage piping" = "sanitary/storm sewer piping").

E. Plumbing System Disinfection and Testing shall be performed by an experienced, qualified, chemical treatment agency. Mt. Hood Chemical, Chemcoa, or approved alternate.

1.03 STORAGE AND HANDLING

A. Provide factory-applied 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. Protect flanges, valves, and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.04 SUBMITTALS

A. Submit catalog data for each product specified.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Copper Pipe and Tube:
   1. Application:
      a. Domestic water
      b. Priming lines
   2. Pipe: ASTM B88.
      a. Above Ground Domestic Water: Type L hard temper copper with soldered joints.
      b. Underground Domestic Water and Priming Lines: Type L soft annealed with no joints or type K hard tempered copper with silver soldered joints.
   3. Fittings: Wrought copper solder-joint fittings, ANSI B16.22.

B. Plastic Pipe – Drain, Waste, Vent (DWV):
   1. Application:
      a. Sanitary waste

b. Plumbing vent
c. Rain drain

2. Pipe:
   a. Acrylonitrile-butadiene-styrene (ABS) (ASTM D3965) plastic drain, waste and vent piping (ASTM F628) and fittings (ASTM D2661) (DWV).
   b. Polyvinyl chloride (PVC) (ASTM D1784) plastic drain, waste and vent pipe (ASTM D2665 and D1785) and fittings (ASTM D2665) (DWV).
3. Fittings: Provide fittings of the type indicated, matching piping manufacture. Where not otherwise indicated, provide socket style, solvent weld fittings produced and recommended for the service indicated by the piping manufacturer.

C. Plastic Pipe:
1. Application: Where approved by Code.
   a. Domestic water, underground
   b. Water heater pan drain
2. Pipe:
   a. Polyvinyl Chloride and Chlorinated Polyvinyl Chloride Plastic Pipe for Water Service: SDR-PR pipe, ASTM D2241; Schedules 40, 80 and 120, ASTM D1785.
3. Fittings: Provide fittings of the type indicated, matching piping manufacturer. Where not otherwise indicated, provide socket style, solvent weld fittings produced and recommended by the piping manufacturer for the service indicated.

D. Plastic Pipe:
1. Application: Where approved by Code.
   a. Domestic water, 2” and smaller.
   b. Priming lines.
2. Pipe:
   a. Cross-linked polyethylene (PEX) tubing for Water Service: ASTM F877; SDR 9. NSF-pw and NSF 61.
3. Fittings: Provide fittings of the type indicated, matching piping manufacturer. Where not otherwise indicated, provide fittings produced and recommended by the piping manufacturer for the service indicated. Inside diameter of the fittings shall not be less than that of the tubing. Crimp ring style fittings are prohibited.

E. Plastic Sewer Piping:
1. Application: 5' outside the building line and 4" through 12".
   a. Sanitary sewer
   b. Storm sewer
2. Pipe: Polyvinyl chloride (PVC), bell and spigot, rubber ring joint, ASTM 3034, SDR 35.
3. Fittings: Provide fittings matching piping manufacturer for the service indicated by the manufacturer.

2.02 MISCELLANEOUS PIPING MATERIALS

A. Soldering and Brazing Materials: Provide soldering materials as determined by the installer to comply with installation requirements.
1. Tin-Antimony Solder: ASTM B32, Grade 95TA.
2. Lead-Free Solder: ASTM B32, Grade HB. Harris "Bridgit" approved.
3. Silver Solder: ASTM B32, Grade 96.5TS.
4. Flux: Water soluble paste flux.
5. Brazing filler rod: BCuP rod to suit conditions.

B. Strainers: "Y-pattern," iron or bronze body rated for pressures indicated with blow-off connection and 20 mesh stainless steel screen.

C. Tracer Wire: 14 gauge, single strand, copper wire with blue insulation for water, green for sanitary and storm sewers, and yellow for gas. 3M "DBY" direct bury splice kit required at all splices.

2.03 PIPING SPECIALTIES

A. Cleanouts: PVC bodies with nickel bronze adjustable top where located in finished or concrete floors.

B. Drains: PVC construction with anchor flange, and other options as indicated by model number.

C. Flashing: Minimum 4# sheet lead; to extend horizontally 10” from edge of vent penetrations and vertically 12” minimum up from roof turned over and down into hub of vent.

D. Priming Valves: Smith 2699, Josam 88250, Wade W8800T, Zurn Z1022, Watts MS810 or equivalent Precision Plumbing, Mifab. Locate in closets, under counters or in walls behind access panels as specified in Section 22 05 00.

E. Traps: Except chrome plated fixture traps. Recessed drainage pattern for threaded pipe and same grade as pipe for plastic pipe; with cleanout plugs in trap body in all above grade locations.

F. Pressure Reducing Valve: Single seat type with renewable stainless steel seat and valve. Size and capacity as shown on Drawings. Bronze bodies with screwed connections on valves 2-1/2” and smaller and flanged steel bodies on valves 3” and larger. Install each PRV with strainer on inlet or internal strainer. Leslie, Watts, Cash-Acme, Zurn-Wilkins, or approved substitute.

G. Backflow Preventer: Where indicated on the Drawings, install a double check backflow preventer complete with shutoff valves, two separate check valves, and test cocks. USC Foundation for Cross Connection Control, State Health Officials, and serving utility approved. Bronze bodies on units 2” and smaller, and cast iron bodies with bronze trim on units 2-1/2” and larger.

2.04 BACKFILL MATERIALS

A. Subbase Materials: A graded mixture of gravel, sand, crushed stone or crushed slag.

B. Finely-Graded Subbase Material: Well graded sand, gravel, crushed stone or crushed slag, with 100% passing a 3/8" sieve.

C. Backfill Material: Soil material suitable for compacting to the required densities, and complying with AASHTO designation M145, Group A-1, A-2-4, A-2-5, or A-3.

2.05 PUMPS

A. Water Pressure Booster: Factory assembled and tested duplex water booster unit complete with pumps, controls, hydro-pneumatic tank, suction and discharge manifolds and all necessary valves, fittings and gauges all mounted on steel support base. One constant speed pump and one variable speed pump.
   1. Pumps: Bronze fitted centrifugal pumps of capacities and types indicated on the Drawings. Provide suction and discharge isolation valve and discharge check valve on each pump. Provide with low/no flow thermal protection system.
   2. Manifolds: 300 series stainless steel piping with suction and discharge pressure gauges and pressure relief valve.
   3. Hydro-Pneumatic Tank: Precharged ASME 125 psi code steel tank with replaceable butyl rubber bladder FDA approved for potable water. Equip tank with system connections, bladder access flange, drain, air charging valve, ASME code relief valve and lifting lugs.
   4. Control Panel: NEMA 3R enclosure pre-wired with disconnect, variable frequenct drives for each pump with 3-leg overload protection, individual pump fused disconnects or circuit breakers, individual pump hand-off-auto selector switches, automatic alternator, control transformer, operating pressure sensor, terminal strip for single field power connection, motor run indicator lights, lead pump failure alarm and protection and low suction pressure shut down with manual reset. UL 508 listed
   5. Acceptable Manufacturers: Flowtherm or approved.

B. Elevator Sump Pump: Submersible, 50 gpm at 17 ft. head, minimum 1/2 horsepower sump pump with integral float switch. Myers, Paco, Hydronix, Zoeller, Viking, Liberty, or approved.

C. Domestic Hot Water Circulator: Bronze body, bronze fitted, in-line circulator with sleeve bearing. Bell & Gossett, Grundfos, Thrush, Wilo, Taco, or Armstrong. Provide with 7-day programmable electronic time clock and aquastat to start and stop the pump.

PART 3 EXECUTION

3.01 UTILITY SERVICE

A. Plumbing Utility Connections: Complete installation. Contact local serving utilities to determine conditions involved and make or arrange to have connection made at proper time and pay all costs involved.

B. Sanitary and Storm Sewers: Connect to or arrange for connection to sanitary and storm sewers as shown on the Drawings and as required by the serving utility. Verify depth, size and location prior to installation of the new sewer systems.

C. Water Service: Connect to or arrange for connection to water service as shown on the Drawings. Verify serving utility requirements prior to beginning any installation. Verify water main size, depth, pressure and location prior to starting work.

D. Fire Service: Connect to or arrange for connection to fire water service as shown on the drawings. Contact local serving utilities to determine conditions involved and make or arrange to have connection made at proper time and pay all costs involved.

3.02 PIPE INSTALLATION

A. Comply with the following applicable HUD standards:
1. HUD UM 76 CPVC & PB Hot and Cold Water Distributing Pipe.
2. HUD UM 78 PE, ABS, PVC, & PB Plastic Piping for Domestic Water.
3. HUD UM 79a ABS & PVC Plastic Pipe and Fittings for Drain, Waste, and Vent.

B. General: Install pipe, tube and fittings in accordance with recognized industry practices and plumbing code standards. Install each run accurately aligned with a minimum of joints and couplings, but with adequate and accessible unions and flanges for disassembly, maintenance and/or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings.

C. Piping Runs: Route piping close to and parallel with walls, overhead construction, columns and other structural and permanent-enclosure elements of the building. Install piping plumb and level except where pitched for drainage. If not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building or equipment and avoid diagonal runs. Wherever possible in finished and occupied spaces, conceal piping from view. Do not encase horizontal runs in solid (concrete or CMU) partitions.

D. Tracer Wire: Install tracer wire as close to underground non-metallic water, sanitary and storm sewers and gas pipe in the trench as possible. Tracer wire shall be accessible at grade via all services, valve and meter boxes, curb cocks, cleanouts at the building, manholes (inside the cover near the top), etc. Locate all points on the record as-installed drawings. Splice into utility tracer system where available. Comply with code requirements.

3.03 PIPING JOINTS

A. General: Provide joints of the type indicated in each piping system, and where piping and joint as manufactured form a system, utilize only that manufacturer's material.

B. Ferrous Threaded Piping: Thread pipe in accordance with ASME B1.20.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound or pipe joint tape (Teflon) where recommended by pipe/fitting

manufacturer, on male threads at each joint and tighten joint to leave no more than three threads exposed.

C. Solder Copper Tube and Fitting Joints: In accordance ANSI B 828 with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. "T-Drill" field formed tees may be utilized where the main is at least two pipe sizes larger than the branch.

D. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards:
1. Heat Joining of Thermoplastic Pipe: ASTM D-2657.
2. Making Solvent-Cemented Joints: ASTM D-2865 and ASTM F-402.

E. Insulating (Dielectric) Fittings: Comply with manufacturer's instructions for installing unions or fittings. Install in a manner which will prevent galvanic action and stop corrosion where the "joining of ferrous and non-ferrous piping" is indicated.

F. Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.

G. Line Grades:
1. Drainage Lines: Run at maximum possible grade and in no case less than 1/4" per foot within building.
2. Vents: Pitch for drainage 1/4" per 10'.
3. Water: Pitch to low points and install hose bib drains. 3' minimum depth of ground cover for all lines outside building unless otherwise noted.

H. Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good installation practice.

I. Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or equipment.

3.04 CLEANOUTS

A. Where required by code, at each change of sewer direction 45 degrees or greater and more than 10’ long, at end of each branch or main and spaced not greater than 100’ apart, as required by code and/or as shown on Drawings.

3.05 MISCELLANEOUS PIPING EQUIPMENT

A. Floor, Wall and Ceiling Plates: Chrome plated pressed steel or brass screw locked split plates on all pipe penetrations in finished spaces.

B. Strainers: Install in a manner to permit access for cleaning and screen removal and with blow-off valve.

C. Sleeves: At all penetrations of concrete or masonry construction. PVC, 24 gauge galvanized steel or Schedule 40 galvanized steel pipe. Use steel pipe sleeves through beams, footings, girders or columns and for all penetrations of walls or floors below grade. Where floor finish is ceramic tile, terrazzo, or similar material extend standard steel pipe sleeves 1-1/2" above finished floor. Fabricate sleeves 1" diameter larger than pipe or insulation. PVC and sheet metal sleeves at non-structural penetrations only.

D. Sleeve Caulking: Caulk below grade pipe with rubber link seal. Grout above grade pipe with cement mortar or approved waterproof mastic. Install UL sealing caulk, putty and/or system at all penetrations of fire rated walls, floors and ceiling.

E. Trap Priming: Traps serving floor drains, floor sinks, catch basins, and similar fixtures shall be primed in accordance with Code requirements.

3.06 EXCAVATING

A. General: Do not excavate for mechanical work until the work is ready to proceed without delay, to minimize the total time lapse from excavation to completion of backfilling. Comply with all applicable Federal and state safety regulations and local erosion control requirements.

B. Width: Excavate for piping with 6" to 9" clearance on both sides of pipe, except where otherwise shown or required for proper installation of pipe joints, fittings, valves and other work. Excavate for other work to provide minimum practical but adequate working clearances.

C. Depth for Direct Support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand-excavate the bottom cut to accurate elevations. Support the following work on undisturbed soil at the bottom of the excavations:
1. Piping of 5" and less pipe/tube size.
2. Cast-in-place concrete.

D. Depth for Exterior Piping: Excavate for exterior water-bearing piping (water and drainage) so that the top of piping will not be less than 2**'** vertical distance below finished grade.

E. Depth for Unsatisfactory Soil Conditions: Where unsatisfactory soil condition at the bottom of excavation exists, excavate additional depth as directed to reach satisfactory soil-bearing condition. Backfill with subbase material, compacted as directed, to indicated excavation depth.

F. Excavated Materials: Store excavated material (temporarily) near the excavation, in a manner which will not interfere with or damage the excavation or other work. Do not store under trees (within the drip line). Retain excavated material which complies with the requirements for backfill material. Dispose of excavated material which is either in excess of quantity needed for backfilling or does not comply with requirements for backfill material.

3.07 BACKFILLING

A. Do not backfill until installed mechanical work has been tested and accepted wherever testing is indicated. Install drainage fill where indicated, and tamp to a uniform firm density. Backfill with finely-graded subbase material to 6" above wrapped, coated and plastic piping. Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to the required densities. Do not backfill with frozen materials.

3.08 CLEANING

A. General: Clean all dirt and construction dust and debris from all mechanical piping systems and leave in a new condition. Touch up paint where necessary.

B Disinfection of Domestic Water Piping System: Disinfect completed piping system in accordance with code requirements. Submit test report upon completion.

C. Sanitary and Storm Drainage System:
1. Remove construction debris from cleanouts, drains, strainers, baskets, traps, etc., and leave same accessible and operable. Place plugs in the end of uncompleted piping at the end of the day or whenever work stops.
2. Before final acceptance of completed sewer system, flush and clean the entire system with water. Trap and remove solid material obtained from flushing and cleaning from the new system. Do not allow debris to enter the existing sewer system.

3.09 TEST

A. General:
1. Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise concealing piping or connecting fixtures or equipment. Where part

of the system must be tested to avoid concealment before the entire system is complete, test that portion separately, same as for entire system.

2. Provide all necessary temporary equipment for testing, including pump and gauges. Remove control devices before testing and do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for the indicated pressure and time.
3. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

B. Repair
1. Repair piping system sections which fail the required piping test by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemical stop-leak compounds, solder, mastics, or other temporary repair methods.
2. Drain test water from piping systems after testing and repair work has been completed.

C. Sewer: Furnish all facilities and personnel for conducting the test. Test in accordance with the requirements of the State Plumbing Inspector and local authorities.

D. Plumbing Waste and Vent Piping: Hydrostatic test by filling to highest point, but not less than 10' water column on major horizontal portion.

E. Water Piping: Hydrostatic pressure of 100 psig without loss for four hours.

3.10 SUPERVISION AND START-UP

A. Adjust flush valves, pressure reducing valves, mixing valves, water heater thermostats, and similar equipment.

END OF SECTION 22 10 00

This page intentionally left blank

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the plumbing equipment.

B. Provide plumbing equipment specified and shown on the Drawings.

C. Related Work: The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Code: Comply with requirements of the Oregon State Plumbing Specialty Code.

B. All equipment and component parts shall conform to governing codes.

C. Labeling: All equipment shall have permanent labels affixed by the manufacturer listing model number, capacity, efficiency, approvals, and similar characteristics of the product.

PART 2 PRODUCTS

2.01 PIPING

A. Piping, fittings, pumps, and related items are specified in Section 22 10 00.

2.02 COMMERCIAL HIGH EFFICIENCY GAS-FIRED STORAGE WATER HEATER:

A. AGA and serving utility approved commercial gas-fired modulating condensing heater complying with the state energy code and ASHRAE 90.1 requirements and of size and capacity shown on Drawings. Minimum water heater efficiency of 90%. Induced draft fan combustion system suitable for venting with plastic vent pipe. Glass-lined steel tank equipped with electronic anode and heat traps. 1-1/2" minimum of non-organic insulation, cold rolled enameled steel jacket to encase sides, top, and combustion chamber. Electronic controller with diagnostics and LED fault display, hot surface igniter, main and pilot gas cocks, automatic gas pressure regulator, all brass hose bib drain, and hand hole cleanout. ASME code pressure-temperature relief valve. Provide with condensate neutralizer.

B. A.O. Smith, Bradford White, Bock, or approved substitute. Water heater must be capable of the venting arrangement shown on the drawings.

2.03 WATER HEATER ACCESSORIES

A. Water Heater and Tank Seismic Restraints: For water heaters and tanks, Spacemaker, Holdrite "Quickstrap," or approved.

B. Domestic Water Expansion Tank: Plastic lined drawn steel tank for potable water with epoxy exterior finish, air charging valve and system piping connection. Butyl rubber diaphragm with steel retaining ring. Provide with relief valve where working pressure rating is less than 150 psi.

C. Water Heater drain pan: Fabricated metal drain pan with reinforced rim and outlet connection.

D. Water heater vent: Provide UL listed venting materials complying with water heater manufacturer's installation requirements.

PART 3 EXECUTION

3.01 UTILITY SERVICE

A. Plumbing Utility Connections: Complete installation. Verify rough in dimensions of equipment prior to installing piping.

3.02 EQUIPMENT INSTALLATION AND CONNECTION

A. All equipment shall be installed plumb and level unless otherwise recommended by the manufacturer.

B. Arrange piping connections to equipment to allow removal and replacement of the equipment without disassembly of connecting piping. Provide valves, unions, flanges, etc. at connection points.

C. Arrange equipment for adequate service access as recommended by the manufacturer and as required by code.

D. Anchor equipment to resist displacement due to seismic events as detailed on the Drawings, recommended by the manufacturer, and as required by code and as specified in other sections of these specifications. Provide seismic straps as specified above for tank type water heaters.

E. Drip Pans: Provide drip pans under all domestic hot water heaters. Provide 3/4" drainage piping, properly discharged to over floor drain or as shown on the Drawings.

3.03 EQUIPMENT CLEANING

A. Remove construction and shipping protection and thoroughly clean all plumbing equipment just prior to building acceptance.

3.04 SUPERVISION AND START-UP

A. Do not place equipment onto operation until required work of other trades is complete, e.g. venting systems, combustion air ducts, etc.

B. Follow manufacturer’s instructions for start-up and adjustment of equipment.

END OF SECTION 22 30 00

This page intentionally left blank

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the plumbing fixtures and trim.

B. Provide fixtures as shown on the Drawings and specified herein. Provide all required fixture trim and accessories for a complete, finished installation.

C. Related Work: The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Code: Comply with requirements of the Oregon State Plumbing Specialty Code.

B. Fixture color: White unless indicated otherwise.

C. Potable Water Valves: Potable water valves not limited to faucets, mixing valves, or pressure reducing valves. Valves shall meet NSF Standard 61, Section 9, for drinking water faucets and shall be brass construction. Brass components which contact water within the faucet shall be from brass which contains no more than 0.25 percent lead by dry weight.

PART 2 - PRODUCTS

2.01 PIPING

A. Piping, fittings, and related items as specified in related Sections 22 10 00.

2.02 PLUMBING FIXTURES AND TRIM

A. Stops: Furnish stop valves for all fixtures. Wheel handle style, in wall, angle or straight through pattern to fit installation. Stops to be all brass with full turn brass stem and replaceable washer, no plastic. Compression nuts to be high copper content brass. Finish to be copper nickel chrome plate where concealed. Finish on exposed stops as noted. Product to carry manufacturer's name. Provide chrome plated shallow escutcheons. McGuire, Chicago, Brasskraft, Keeney, Zurn, or approved substitute.

B. Fixture Traps: Exposed fixture tailpieces, traps, and wastes shall be chrome plated 17 gauge seamless brass tube with cast brass nuts and deep or box style escutcheons as required to conceal rough piping. Products to be stamped with manufacturer's name and material gauge. McGuire, Keeney, Zurn, or approved.

C. Provide insulating covers on all exposed accessible lavatory and sink fixture traps and water supplies. Covers to be ASTM C1822 compliant.

D. 1.28 Gallon, Water Closet, Tank Type, Vitreous China: Water closet shall be specifically designed for 1.28 gallon siphon jet flush.
   1. Seat: Solid white heavy weight molded plastic seat, with molded-in bumpers; open front with cover for elongated bowl with check and self-sustaining hinge. Hinge and hardware to be 300 Series stainless steel. Church 295-SSC, Beneke 523-SS/CH-B, Bemis 1955 SS/C, or Zurn Z5956SS-EL-STS.
   2. Floor Mounted "WC-1": American Standard 2898.010, Kohler K-3432, Eljer 091-0225.
   3. Floor Mounted, 18" High "WC-2": American Standard 2998.010, or Kohler K-3427, Eljer 091-0285.

E. Lavatory, Vitreous China, "LV-1":
   1. Faucet: Chrome plated brass body with handle for the handicapped, vandal resistant 1.5 gpm aerator, with grid strainer waste. Symmons "S-60-G-H" metering faucet, **[Delta 516WF HGM HDF, Grohe 33.024 w/07.542, Moen 8430 or Symmons S20-2G-FR-W]**.

2.. Wall Hung, 20" x 18" Size "LV-": Provide with concealed arm hangers and wall backing plate (Jay R. Smith, Josam, Wade, Watts, or Zurn). American Standard 0355.012, Kohler K-2005, or Eljer 051-2104.
3. Counter Mounted, Self-rimming, 19" Diameter Round "LV-": American Standard 0491.019, Kohler K-2202, or Eljer 051-0174.
4. Counter Mounted, Self-rimming, Oval "LV-": American Standard 0476.028, Kohler K-2196, or Eljer 051-3514.

F. Service Sump (Mop Basin)" ":
1. Faucet exposed, brass body, rough plated, long spout, top brace, hose end spout with bucket hook, vacuum breaker and integral stops in shanks. Chicago 897, T & S B-0665-BSTP, or equal Zurn, Delta Commercial, mounted 24" above rim. Install with 18 gauge type 302, No. 4 finish stainless steel splash on the two walls.
2. Molded stone 24" x 36" x 10" deep with vinyl bumper guard and 3" brass body strainer outlet. Fiat, Mustee, Swan or approved substitute.

G. Stainless Steel Sink, " ":
1. Type 302 or 304, 18 gauge, self-rimming stainless steel sink, fully undercoated, drawn bowl with satin finish. Elkay numbers are listed; or approved substitute. Install with stainless steel crumb cup strainer outlet, flange tail piece, and 1-1/2” trap; Elkay, Keeney, or approved. For faucets, Chicago and T&S numbers are listed; equal Zurn, Delta Commercial approved. **[Delta numbers listed; equal Moen Symmons approved.]**
2. Single Compartment "KS-1 ": ": Install with faucet with 1.5 gpm aerator. Elkay DSE12522.
3. Single Compartment "KS-2 ": ": Install with faucet with 1.5 gpm aerator. Elkay ECTSRAD25226.
4. Install with 1/2 HP garbage disposal where indicated in compartment in lieu of strainer outlet. ISE 333SS, Waste King SS-2600, Kitchenaid KWC-200C or approved substitute.

H. Recessed Clothes Washer Fitting, " ": Hot and cold water valve washing machine waste outlet with quarter turn ball valves and water hammer arresters. Sioux Chief Ox Box. Fire rated where required. Provide with indirect waste funnel where used for condensate disposal.

I. Recessed Single Water Fitting, " ": Hot or Cold water connection with water hammer arrester and quarter turn ball valve. Sioux Chief Ox Box. Fire rated where required.

J. Laundry Tray, " ":
1. Molded stone wall hung laundry trays with type 304 stainless steel grid strainer outlet, Just J15SSF, 1-1/2" chrome plated cast brass "P" trap, Fiat A-1 faucet **[A-7 bubbler]** and wall support brackets. Color as selected by Architect.
2. Single Compartment " ": Fiat L-1.
3. Double Compartment " ": Fiat LTD.

K. Fiberglass Tub/Shower: 60” x 32” fiberglass one-piece tub with drain assembly. Universal rough-in valve body with pressure balance trim, diverter tub spout, shower outlet elbow, and shower head. Provide with 1.75 gpm shower flow restrictor. Symmons S-9602-P. Tub surround to include backing for ADA grab bars. Everfab TS6032A0, Fibercare WT60-32HC.

L. Accessible Fiberglass Tub/Shower: 60” x 32” fiberglass one-piece tub with drain assembly. Universal rough-in valve body with pressure balance trim, diverter tub spout, shower outlet elbow, and shower head, slide bar, and 60” flex hose. Provide with 1.75 gpm shower flow restrictor. Symmons S-9602-P. Tub to include backing for ADA grab bars. Grab bars to be provided loose. Everfab TS6032A0, Fibercare WT60-32HC.

M. Hose Bibs:
1. Outside "HB-": Non-freeze type with vacuum breaker, bronze wall casing and wall clamp. Zurn Z-1310-6, Wade W-8620, Woodford 67 Series, Smith 5609-PB, or Watts HY420.

N. Fixtures Furnished by Owner (and/or Under Another Section): Some fixtures will be furnished by the Owner (and/or under another specification section). Include under this section the

required rough-ins, 3/8" chrome plated supplies with stops, 1-1/2" chrome plated cast brass "P" trap (or, on kitchen sinks, 2" cast iron "P" traps) for each sink compartment, and make final connection. Verify all rough-ins and connection requirements before commencing work.

PART 3 EXECUTION

3.01 PIPING

A. Install in accordance with Section 22 10 00.

B. Install secondary pipe supports at rough-ins for all plumbing fixtures.

3.02 FIXTURE INSTALLATION AND CONNECTION

A. All exposed fixture hardware and piping shall be plated with polished chrome unless otherwise directed in these specifications.

B. All fixtures in contact with finished walls and floors shall be caulked with waterproof, white, non-hardening sealant which will not crack, shrink or change color with age.

C. All fixtures and component parts shall conform to governing codes.

D. All fixtures shall be securely mounted level and plumb or as recommended by the manufacturer. Mount fixtures intended to be accessible to the handicapped at the dimensions required by code.

3.03 STARTUP

A. Adjust flush valves, pressure reducing valves, mixing valves, water heater thermostats, hot water circulating system balancing valves, and similar equipment.

B. Remove construction protection, tags and labels and thoroughly clean all plumbing equipment and trim. Scour all fixtures just prior to building acceptance.

END OF SECTION 22 40 00

This page intentionally left blank

SECTION 23 05 00
HVAC MATERIALS AND METHODS

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the HVAC work specified in this Division.

B. The requirements of this Section apply to the HVAC systems specified in these Specifications and in other Division 23 sections.

C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes.

D. The work shall include, but not be limited to, the following systems:
   1. Fuel supply system.
   2. Heating and cooling equipment.
   3. Complete piping systems including insulation, valves, supports, etc.
   4. Air handling equipment including packaged equipment and exhaust fans.
   5. Air distribution systems including ductwork, terminal units, dampers, insulation, and air inlets and outlets.
   6. HVAC control system.
   7. Special systems as specified herein.

E. Advise subcontractor, suppliers, and vendors involved in the work specified in this Section of the applicable requirements.

1.02 QUALITY ASSURANCE

A. All work and materials shall conform to all applicable local and state codes and all federal, state and other applicable laws and regulations. All clarifications and modifications which have been cleared with appropriate authorities are listed under the applicable sections. All electrical products shall bear the label of a recognized testing laboratory such as UL or CSA.

B. Whenever the requirements of the Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

C. Codes and Standards: Comply with the provisions of the following referenced codes, standards and specifications:
   1. Federal Specifications (FS)
   2. American National Standards Institute (ANSI)
   3. National Electrical Manufacturer's Association (NEMA)
   4. National Fire Protection Association (NFPA)
   5. Underwriters Laboratories, Inc. (UL)
   6. Factory Mutual (FM)
   7. International Building Code (IBC) with State and Local Amendments
   8. International Mechanical Code (IMC) with State and Local Amendments
   9. Uniform Plumbing Code (UPC) with State and Local Amendments
   10. Oregon Zero Energy Ready Commercial Code
   11. American Society for Testing and Materials (ASTM)
   12. Americans with Disabilities Act (ADA)
   13. International Fire Code (IFC) with State and Local Amendments
   14. Energy Policy Act (EPAct)
   15. Manufacturers Standardization Society (MSS)
   16. American Gas Association (AGA)

D. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name. Where two or more units of the same class of equipment are furnished, use product of the same manufacturer; component parts of the entire system need not be products of same manufacturer. Furnish all materials and equipment, new and free from defect and of size, make, type and quality herein specified or approved by the Architect. All materials shall be installed in a neat and professional manner.

E. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

F. The Drawings and Specifications are complementary. What is called for by one shall be as though called for by both.

G. Drawings: Do not scale drawings for roughing-in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings as required. Coordinate work with shop drawings of other specification divisions.

H. Field Wiring: It is the intent of these specifications that all systems shall be complete and operable. Refer to all drawings and specifications, especially the electrical drawings, to determine voltage, phase, circuit ampacity and number of connections provided. Provide all necessary field wiring and devices from the point of connection indicated on the electrical drawings. All equipment shall be installed in compliance with the Electrical Code and the equipment's UL listing. Bring to the attention of the Architect in writing, all conflicts, incompatibilities, and/or discrepancies prior to bid or as soon as discovered.

1.03 WORK OF OTHER CONTRACTS

A. Work under this contract shall be conducted in a manner to allow for the future installations of such equipment or items listed in other sections of this Specification.

1.04 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. Plumbing piping systems and fixtures and fire suppression piping systems are specified under other Divisions of these Specifications except for provisions or items specifically noted on the Drawings or specified herein.

C. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

D. All sections of Division 23 are interrelated and shall be considered in their entirety when interpreting any material, method, or direction listed in any section of Division 23. Individual sections are not written for specific subcontractors or suppliers but for the General Contractor.

1.05 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES (SUBMITTALS)

A. Submit in accordance with Division 1 full technical and descriptive shop drawing data on proposed materials and equipment as detailed in each section.

B. The Contractor shall verify that all equipment submitted can be delivered and installed within the time constraints of the construction period.

C. Include the manufacturer, type, style, catalog number, complete specification, certified dimensions, and description of physical appearance for each item and option submitted. Reproduction of catalog data sheets shall be clean and legible to show all details, including gauge of metal used.

D. Include only information on exact equipment to be installed, not general catalogs of the manufacturer. Where sheets show proposed equipment as well as other equipment, identify proposed equipment with rubber stamp arrow or similar concise method.

E. Submit with each copy a transmittal letter verifying that all included equipment submittals have been carefully considered for quality, dimensions, function, and have been coordinated with the Drawings and Specifications. Guarantee that proposed materials will meet or exceed the quality and function of those specified.

F. Include field wiring diagrams and connection diagrams for all control and/or low voltage systems, including floor plans.

G. Submittal Review: The submittal review process is a means to provide quality control. The action noted to be taken (or where conflicts with the contract documents are not noted) shall not be interpreted by the Contractor as automatic "change orders." Approval of the data for substitution and shop Drawings shall not eliminate the contractor's responsibility for compliance with Drawings or Specifications, nor shall it eliminate the responsibility for freedom from errors of any sort in the data discovered prior to or after the review process. Deviations, discrepancies, and conflicts between the submittals and the Contract Documents shall be called to the Architect's attention in writing at the time of transmittal of the data.

1.06 PRODUCT SUBSTITUTION

A. Materials other than those specified may be approved for this project providing a written request is submitted to the Architect prior to bid in accordance with Instructions to Bidders. Requests shall include complete specifications, dimensions, manufacturer and catalog number for each item for which approval is desired. If, in the opinion of the Architect, the material is not complete or if it is not an acceptable substitute, he may reject it. The Architect's evaluation will be based solely on the material submitted.

1.07 CHANGE ORDERS

A. All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labor and materials without exception. At the Architect's request, the contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

1.08 RECORD DOCUMENTS

A. Project Record (As-Installed) Drawings:
   1. Maintain a set of record drawings on the job site as directed in Division 1.
   2. Keep Drawings clean, undamaged, and up to date.
   3. Record and accurately indicate the following:
      a. Depths, sizes, and locations of all buried and concealed piping dimensioned from permanent building features.
      b. Locations of all valves.
      c. Locations of all fire dampers and other airflow control devices.
      d. Changes, additions, and revisions due to change orders, obstructions, etc. Eradicate extraneous information.
      e. Model numbers of installed equipment.
   4. Make Drawings available when requested by Architect for review.
   5. Submit as part of the required Project Closeout documents.

B. Operating and Maintenance Manuals: Submit five (5) sets of Operating and Maintenance Instructions, including manufacturer's service data, wiring diagrams, and parts lists and vendors for all serviceable items of equipment, valve charts, balancing data, final control diagrams showing final set points, and any additional equipment added by change order, bound in three-ring, vinyl or canvas covered, loose-leaf binders organized with index and thumb-tab markers for each classification of equipment or data.

1.09 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the contractor shall agree to pay for the cost of repair of the reported defect by a Contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 GENERAL

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of two years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Compatibility: Provide products which are compatible with other portions of the work and provide products with the proper or correct power and fuel-burning characteristics, and similar adaptations for the project.

C. Efficiency: Heating and cooling equipment shall comply with ASHRAE Standard 90.1-2001 and the State Energy Code. Where equipment efficiencies are indicated, the use of alternate or substitute manufacturer’s equipment with lower efficiencies is not permitted.

D. Storage and Handling:
   1. Delivery: Deliver to project site with manufacturer's labels intact and legible.
   2. Handling: Avoid damage.
   3. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

2.02 ACCESS PANELS

A. Manufacturers: Inryco/Milcor, Bilco, Elmdor, Karp, Potter-Roemer or accepted substitute. Inryco/Milcor Style DW, K, or M panels as required by construction.

B. Construction: Flush style, fire rated in fire rated partitions and ceilings. Screwdriver latches on all access panels.

2.03 VALVES

A. General: Provide factory fabricated valves of the type, body material, temperature and pressure class, and service indicated. Bronze gate, globe and check valves shall comply with MSS-SP-80. Ball valves shall comply with MSS-SP-110. Iron gate and globe valves shall comply with MSS-SP-70. Iron check valves shall comply with MSS-SP-71. Butterfly valves shall comply with MSS-SP-67. Valve size same as connecting pipe size.

B. Acceptable Manufacturers: Milwaukee, Crane, Grinnell, Nibco, Hammond, Stockham, Legend, FNW, Watts, and Walworth. NIBCO numbers are given except as noted. Where possible, provide valves from a single manufacturer.

C. Valve Styles: See individual Division 23 sections for valve styles.

D. Selection of Valve Ends (Pipe Connections): Select and install valves with ends matching the types of pipe/tube connections.

2.04 HANGERS AND SUPPORTS

A. General: Provide factory-fabricated horizontal piping hangers, clamps, hanger rod, inserts, supports, etc., of the indicated MSS type and size. The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry Practice SP-58 and SP-69 are referenced in this section.

B. Manufacturers: B-Line, Carpenter & Paterson, Grinnell, Michigan, Superstrut, Tolco, Erico, or accepted substitute. Grinnell figure numbers in parentheses where applicable (or other manufacturers as noted).

C. Corrosion Protection: Provide materials which are zinc plated or factory painted to prevent corrosion. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, plastic coated, or by other recognized industry methods.

2.05 PENETRATION FIRE STOPPING

A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories. 3M, Metacaulk, SpecSeal, or approved.

B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, roughing-in dimensions and equipment locations before proceeding with any of the work.

B. Utility Locations: The location of existing utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the Drawings and are taken from existing records. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.

C. Sleeves, Inserts, Cast-in-Place Work: Provide sleeves, inserts, anchoring devices, cast-in-place work, etc. which must be set in concrete sequenced at the proper time for the project schedule.

D. Coordination:
   1. The Drawings are based on equipment of a certain manufacturer and may be identified as such. Where alternate manufacturers or approved substitutes are incorporated into the work, any required design changes are the responsibility of the contractor. Such changes may include changes in utility or system connection sizes, location, or orientation, service clearances, structural support or acoustic considerations.
   2. Where the work must be sequenced and positioned with precision in order to fit into the available space, prepare accurate scale shop Drawings showing the actual physical dimensions required for the installation and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.
   3. Cooperate with other trades in furnishing material and information for sleeves, bucks, chases, mountings, backing, foundations and wiring required for installation of mechanical items.
   4. Coordinate all work with other trades and determine in advance where interfacing of the mechanical work and other work are required to be connected together. Provide all materials and equipment to make those connections. Submit shop drawings showing required connections where special conditions exist.

E. Discrepancies: Report immediately any error, conflict or discrepancy in Plans, Specifications and/or existing conditions. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping be necessary, provide for approval the simplest layout possible for that particular portion of the work.

3.02 UTILITY COORDINATION

A. Utility Coordination: Coordinate all aspects of the incoming utility services indicated with the city engineer, serving utility, and the off-street improvements contractor. Requirements of the utility company which exceed the provisions made on the Drawings or covered by these Specifications shall take precedence. Provisions made on the Drawings or Specifications in excess of the utility company's requirements shall take precedence. No additional compensation will be allowed the contractor for connection fees or additional work or equipment not covered in the Drawings or Specifications which are a result of policies of the serving utilities.

3.03 MECHANICAL EQUIPMENT WIRING

A. Provide all mechanical equipment motors, automatic temperature, limit, float and similar control devices required, with wiring complete from power source indicated on Electrical Drawings.

B. Provide properly rated motor overload and undervoltage protection and all manual or automatic motor operating devices for all mechanical equipment.

C. Equipment and systems shown on the Drawings and/or specified, are based upon requirements of specific manufacturers which are intended as somewhat typical of several makes which may be approved. Provide all field wiring and/or devices necessary for a complete and operable system including controls for the actual selected equipment/system.

3.04 GENERAL INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes, Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain adequate clearances for repair and service to all equipment and comply with Code requirements.

B. Arrangement: Arrange piping parallel with primary lines of the building construction, and with a minimum of 7' overhead clearance in all areas where possible. Unless indicated otherwise, conceal all piping. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance. Give right-of-way to piping which must slope for drainage. Set all equipment level or as recommended by manufacturer. Under no conditions shall beams, girders, footings or columns be cut for mechanical items. Casting of pipes into concrete is prohibited unless so shown on Drawings.

C. Access Panels: Provide access panels with proper backing reinforcement for all equipment, dielectric unions, valves and items requiring service and installed above ceilings, behind walls, or in furring, complete with correct frame for type of building construction involved. Exact size, number and location of access panels are not necessarily shown on Drawings. Use no panel smaller than 12" by 12" for simple manual access or smaller than 16" x 20" where personnel must pass through.

D. Adjusting: Adjust and calibrate all automatic mechanical equipment, temperature controls, float devices, etc. Adjust flow rates at each piece of equipment or fixture.

E. Building Vapor Barrier: Wherever the building insulation vapor barrier is penetrated by piping, hangers, conduits, etc., provide clear self-adhesive tape recommended by the insulation manufacturer around the penetrations.

3.05 VALVE INSTALLATION

A. General: Comply with the following requirements:
   1. Install valves where required for proper operation of piping and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping, and where shown on the drawings.
   2. Locate valves in accessible spaces (or behind access panels) and so that separate support can be provided when necessary.
   3. Install valves with stems pointed up, in the vertical position where possible, but in no case with stems pointed downward from a horizontal plane.

B. Valve Access: Provide access panels to all valves installed behind walls, in furring or otherwise inaccessible.

3.06 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Proceed with the installation of hangers, supports and anchors only after the required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) the proper placement of inserts, anchors and other building structural attachments.
   1. Install hangers, supports, clamps, and attachments to support piping and equipment properly from the building structure. Use no wire or perforated metal to support piping, and no supports from other piping or equipment. For exposed continuous pipe runs, install hangers and supports of the same type and style as installed for adjacent similar piping.
   2. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated or by other recognized industry methods.
   3. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at panel points only.

B. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units. Install specified seismic restraints to restrict excessive movement.
   2. Install hangers and supports so that equipment and piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
   3. Install hangers and supports to provide the indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.

C. Pipe Support:
   1. Vertical Spacing: Support at base, at equivalent of every floor height (maximum 10' as required by Code) and just below roof line.
   2. Screwed or Welded Steel or Copper Piping: Maximum hanger spacing shall be as follows:

	Steel	Copper
1-1/4" and smaller	7' span	6' span
1-1/2" pipe	9' span	6' span
2" pipe	10' span	10' span
2-1/2" & larger	12' span	10' span

   3. Install additional hangers or supports at concentrated loads such as pumps, valves, etc. to maintain alignment and prevent sagging.
   4. Support Rod: Hanger support rods sized as follows:

Pipe and Tube Size		Rod Size	
Inches	mm	Inches	mm
1/2” to 4”	12.7 to 101.6	3/8”	9.5
5” to 8”	127.0 to 203.2	1/2”	12.7
10” to 12”	254.0 to 304.8	5/8”	15.9

D. Adjust hangers and supports to bring piping to proper levels and elevations.

E. Provide all necessary structural attachments such as anchors, beam clamps, hanger flanges and brackets in accordance with MSS SP-69. Attachments to beams wherever possible. Supports suspended from other piping, equipment, metal decking, etc., are not acceptable.

F. Horizontal banks of piping may be supported on common steel channel member spaced not more than the shortest allowable span required on the individual pipe. Maintain piping at its relative lateral position using clamps or clips. Allow lines subject to thermal expansion to roll axially or slide. Size channel struts for piping weights.

G. Installation of drilled-in concrete anchors shall comply with the manufacturer's instructions for working load, depth of embedment, and spacing between anchors and from the edge of the slab. Use only wedge-style anchors.

3.07 EQUIPMENT CONNECTIONS

A. Provide complete connections for all items of equipment requiring such connections, including incidental piping, fittings, trim and labor necessary for a finished working installation.

B. Verify the rough-in and finish requirements for all equipment provided under other Divisions of the work and requiring HVAC piping or duct connections with equipment supplier and installer prior to rough-in.

3.08 PROTECTION

A. Protect all work and materials against loss or damage. Close all pipe openings with caps or plugs. At final completion, thoroughly clean and deliver all work and equipment in an unblemished new condition. Keep all motors and bearings in watertight and dustproof covers during entire course of installation.

B. Protect floors, walls, framing and sheathing where pipe cutting and threading operations are conducted with plastic sheeting under plywood sheets. Extend plastic sheeting beyond the plywood. Clean-up metal cuttings, oil, etc., daily or as necessary to prevent debris from being tracked beyond the protected area. Damages, as determined by the Architect, due to the pipe cutting/threading operation shall be repaired by the responsible trade.

3.09 PIPE PENETRATION FIRE STOPPING

A. Install as recommended by manufacturer and in accordance with the product's UL listing. Below are the minimum installation requirements.
   1. Install specified penetrating item(s) with required annular spacing in proper size wall or floor opening. Support penetrating item(s) adequately on both sides of construction.
   2. Clean all opening and penetrating item surfaces in penetration area to remove loose debris, dirt, oil, wax, grease, old caulking, etc.
   3. If needed or required for gypsum or concrete block walls, install specified galvanized steel wire mesh or sleeve recessed and centered inside wall around penetrating item(s) so that it is snug against perimeter of opening.
   4. When required, install specified type and depth of backing material in annular space, recessed to required fill depth of fire stopping caulking.
   5. Gun, trowel, and/or pump fire stopping sealant to specified depth in annular space around penetrating item(s). Trowel sealant surfaces flush with wall or floor surfaces to a smooth, defect-free finish. Where required, apply specified size caulking bead around penetrating item(s) at zero annular contact areas and tool smooth.

3.10 HVAC WORK CLOSEOUT

A. General: Refer to the Division 1 sections for general closeout requirements. Calibrate all equipment requiring same. Complete each system as shown or specified herein and place in operation except where only roughing-in or partial systems are called for. Each system shall be tested and left in proper operation free of leaks, obstructions, or contamination.

B. Record Drawings: Submit record set of drawings as previously specified in this Section.

C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Architect present, and with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system and replace dirty filters, excessively worn parts and similar expendable items of the work.

D. Operating Instructions: Conduct a walk-through instruction seminar for the Owner's personnel who are to be involved in the continued operation and maintenance of the HVAC equipment and

systems. Provide written instructions outlining and explaining the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar features of the systems.

END OF SECTION 23 05 00

This page intentionally left blank

SECTION 23 07 00
HVAC INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the insulation of mechanical equipment specified elsewhere in these specifications.

B. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Minimum Insulation Thickness and Thermal Performance: Comply with the requirements of the 2019 Oregon Zero Energy Ready Commercial Code using the 2018 IECC alternate.

B. Composite (Insulation, Jacket or Facing and Adhesives) Fire and Smoke Hazard Ratings: Not to exceed a flame spread of 25 or smoke development of 50 and containing less than 0.1% by weight deca-PDE fire retardant.

C. Component Ratings of Accessories (Adhesives, Mastics, Cements, Tapes, Finishing Cloth for Fittings): Same as "B" requirements above and permanently treated. No water soluble treatments.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to the requirements specified in Section 23 05 00, the following apply:
   1. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products. Store insulation in original wrappings and protect from weather and construction traffic.
   2. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

1.04 SUBMITTALS

A. Submit catalog data and performance characteristics for each product specified.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Insulating Manufacturers: Johns Manville, Knauf, Armstrong, Owens-Corning, Pittsburgh Corning, Pabco, Imcoa, Nomaco, or Certain Teed. Johns Manville products are listed unless indicated otherwise.

B. Adhesive Manufacturers: Foster, 3M, Insul-Coustic, Borden, Kingco or Armstrong.

2.02 PIPING INSULATION

A. Pipe Temperatures Minus 30 to 180 Deg. F: Flexible, preformed, pre-slit, self-sealing elastomeric pipe insulation, thermal conductivity of 0.27 BTU/hr. sq. ft./in. at 75 deg. F and vapor transmission rating of 0.2 perms/inch. Armstrong "Armaflex 2000" or, in concealed locations, Imcoa or Nomaco also approved.

2.03 DUCT INSULATION

A. Interior Above Grade Ductwork: Glass fiber formaldehyde-free blanket with "FSK" facing containing less than 0.1% by weight deca-PDE fire retardant, k value = 0.31 at 75 deg. F, 0.2 perms, and UL 25/50 surface burning rating. Johns Manville "Microlite."

2.04 INSULATION ACCESSORIES

A. Insulation Compounds and Materials: Provide rivets, staples, bands, adhesives, cements, coatings, sealers, welded studs, etc., as recommended by the manufacturers for the insulation and conditions specified except staples not permitted on chilled water lines.

PART 3 EXECUTION

3.01 PIPING INSULATION

A. Refrigerant Piping Insulation: Insulate suction piping with minimum 1" thick foamed plastic or of thickness necessary to prevent condensation at 85 deg. F and 70% RH. Where possible, slip insulation over the piping as it is installed. Seal all joints and seams.

B. Condensate drains: Insulate drains exposed to outdoor temperatures with 1/2” thick elastomeric pipe insulation. Insulate over heat tape.

3.02 DUCTWORK INSULATION

A. Ductwork: Insulate the following:
   1. All supply ductwork.
   2. All supply and return ductwork in systems routed in unconditioned spaces or exposed to the outside conditions.
   3. All outside air intake ducts.
   4. All ductwork required to be insulated by code.

B. Insulation Thickness: Select board and blanket insulation of thickness required to provide the following installed R-value.
   1. All heating or cooling system supply and return ducts located on the exterior of the insulated building envelope and all outside air intake ducts, R-8.
   2. All heating and cooling system supply and return ducts located in unconditioned spaces, R-6.
   3. All heating and cooling system supply ducts located in conditioned spaces where exposed in unfinished spaces or concealed from view in finished spaces, R-3.3. Exposed ductwork in finished spaces shall not be externally insulated.

C. Fittings: Install with wire, straps, and duct adhesive as required. To prevent sagging on all rectangular or square ducts over 24" wide, install Gramweld or equal welding pins on the bottom. Maximum spacing 18" on center in both directions.

D. Installation: Applied with butt joints, all seams sealed with vapor seal mastic or taped with 2" wide vapor-proof, pressure-sensitive tape. Seal all penetrations with vapor barrier adhesive.

E. Internally Lined Ductwork: Where internally lined ductwork is indicated on the Drawings and/or specified, no exterior insulation is required. Select duct lining to provide the required R-value. Carefully lap the ends of the exterior insulation a minimum of 6" past the interior insulation unless otherwise shown. Seal the end of vapor barrier jacket to the duct with mastic where the vapor barrier is required. Duct lining is specified in Section 23 30 00.

END OF SECTION 23 07 00

This page intentionally left blank

SECTION 23 10 00
FACILITY FUEL SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the fuel storage, handling, and distribution systems for the facility.

B. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 SUBMITTALS

A. Required for all specified items.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Black Steel Pipe:
   1. Applications: Natural gas, above ground only.
   2. Pipe: Systems 10" or smaller, operating below 400 psi, schedule 40, standard black steel pipe ASTM A-120 or A-53.
   3. Threaded Fittings: For above ground installations only. Banded class 150 malleable iron fittings, ANSI B16.3 to 150 psi.

B. Flexible Fuel Gas Piping (CSST):
   1. Application: 5 psi or less:
      a. Natural gas, indoors only.
   2. Pipe: Corrugated 300 series stainless steel tubing with yellow polyethylene jacketing.
   3. Fittings: Fittings shall be yellow brass and provide a self-flaring connection to the tubing. Systems incorporating gaskets or o-rings are not acceptable.
   4. Underground Installations: CSST pre-sleeved with heavy wall internally ribbed polyethylene secondary venting conduit with end seals and vent connection fittings.
   5. Approvals: System shall be listed by an approved independent laboratory and approved for use by the local code officials. TracPipe, Gastite, Wardflex, or approved.

2.02 PIPING ACCESSORIES

A. Fuel Gas Valves: UL listed or AGA approved valves.
   1. 10 psig or Less:
      a. Ball: NIBCO bronze body T/S 585-70-UL, brass body FP-600.

B. Gas Appliance Connectors: For low pressure gas connection to indoor or outdoor stationary appliances, AGA approved corrugated stainless steel tubing with zinc plated steel end fittings.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes and Regulations and good common practice in locating and installing mechanical equipment and material so that complete installation presents the least possible hazard. Maintain adequate clearances for repair and service to all equipment. Installation of any equipment with less than minimum clearances shall not be accepted.

B. Anchorage: Anchor and/or brace mechanical equipment, piping and ductwork to resist displacement due to seismic action, include snubbers on equipment mounted on spring isolators.

3.02 PIPE INSTALLATION

A. General: Install pipe, tube and fittings in accordance with recognized industry practiced for each indicated service without piping failure. Install each run with a minimum of joints and

couplings, but with adequate and accessible unions and flanges for disassembly, maintenance and/or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections.

B. Ferrous Threaded Piping: Thread pipe in accordance with ANSI 82.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave no more than 3 threads exposed.

C. Flexible Gas Piping (CSST): Comply with manufacturer's recommendations for system installation. Provide striker plates and supports as required. All penetrations of finished walls, including mechanical room walls, shall be accomplished using surface or recessed termination fittings. Where installed underground below a building, vent the conduit to outdoors per Code.

D. Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.

E. Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good installation practice.

F. Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or equipment.

3.03 GAS SERVICE

A. Contact Northwest Natural Gas Co. for service as required and pay all costs involved. Run all gas distribution piping and make final connections to all gas using equipment. Install regulators to deliver proper inlet pressures and vent regulators to outside where required.

3.04 CLEANING

A. General: Clean all dirt and construction dust and debris from all mechanical piping systems and leave in a new condition. Touch up paint where necessary.

B. Fuel Piping: Blow clear of debris with nitrogen or oil free air.

3.05 TEST

A. General: Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise concealing piping or connecting fixtures or equipment. Where part of the system must be tested to avoid concealment before the entire system is complete, test that portion separately, same as for entire system.

B. Natural Gas Piping: One half hour minimum air at 60 psig for 2 psig gas, and 15 minutes at 10 psig for 7" water gauge natural gas or as approved and certified by serving utility.

END OF SECTION 23 10 00

This page intentionally left blank

SECTION 23 30 00
AIR DISTRIBUTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide Air Distribution Materials as specified herein and as shown on the Drawings.

B. Material characteristics and size shall be as indicated on the Drawings.

C. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Air Distribution Equipment Rating: In accordance with AMCA certified rating procedures and bearing the AMCA label.

1.03 SUBMITTALS

A. Submit catalog data, construction details and performance characteristics for all manufactured materials.

B. Submit operating and maintenance data.

PART 2 PRODUCTS

2.01 SHEET METAL

A. Quality Assurance: Galvanized steel sheet metal except where otherwise indicated. Metal gauges, joints and reinforcement in accordance with Mechanical Code, ASHRAE and SMACNA standards. Minimum 30 gauge.

B. Duct Sealing Tapes: Provide a UL 181B listed ductwork sealing system.

C. Concealed Round Duct: Snap lock longitudinal seam duct shall fully comply with SMACNA standards for duct gauge and seam type for 1/2” pressure class. Concealed flexible ductwork is not permitted.

2.02 ACCESSORIES

A. Fire Dampers:
   1. Static Fire Dampers: Constructed and installed in accordance with NFPA No. 90A and UL labeled.
   2. Dynamic Fire Dampers: Constructed and approved in accordance with UL Standard 555 for horizontal or vertical installations. Selection of dampers shall not exceed manufacturer's recommended CFM at 4" of static pressure for unducted dampers and 8" of static pressure for ducted dampers.

B. Fire Rated Thermal Blanket and Diffuser Fire Damper: UL listed, non-asbestos ceramic thermal blanket for use on ceiling diffusers with curtain type fire damper to fit diffuser neck indicated.

C. Dryer Venting Accessories:
   1. Vent Elbow: Long radius (10”) stamped 45 and 90 degree elbows.
   2. Vent termination: Sidewall hooded cap with backdraft damper, 4” duct connection.

PART 3 EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Air Handling Equipment Installation and Arrangement: Install and arrange as shown on Drawings. Comply with the manufacturer's recommendations for installation, connection, and start-up.

B. Equipment Access Panels: Locate free of all obstructions such as ceiling bars, electrical conduit, lights, ductwork, etc.

3.02 DUCTWORK INSTALLATION

A. Support: Install ductwork with 1" wide strap cradle hangers not more than 8' on centers or as required by code. Support equipment independent of adjacent ductwork. Attach to available building construction according to good practices for materials involved.

B. Duct Insulation: Specified in Section 23 07 00.

C. Access: Install necessary access opening and covers for cleaning, wiring or servicing motors, filters, fans, both entering and leaving air sides of coils, fire and/or smoke dampers and to other equipment located within or blocked by sheet metal work.

D. Dryer Vent Ducts: Install with rigid sheet metal duct only. Lap duct joints in direction of airflow. Hanging or attaching fasteners shall not penetrate the duct.

E. Sealing: Caulk, seal, grout and/or tape ductwork and plenums to make airtight at seams, joints, edges, corners and at penetrations. Install specified tape in accordance with manufacturer's requirements using degreaser on surfaces to be taped and wiped to eliminate moisture.

3.03 FIRE DAMPERS

A. Provide fire dampers with rating equal to surrounding construction where penetrations are made through fire resistant rated construction per applicable codes and installed in accordance with UL label requirements. Locate fusible links for easy service or replacement and provide access panels of proper fire rating. Size fire dampers to maintain free area through fire damper same as unobstructed run of duct. Where dampers are installed in forced air systems which may not shut down under fire conditions, dampers shall be UL "dynamic-rated" dampers.

3.04 NEW DUCTWORK CLEANING

A. Store all ductwork materials on pallets or above grade, protected from weather, dirt/mud and other construction dust.

B. Remove all accumulated dust, dirt, etc. from each duct section as it is being installed.

C. Clean all diffusers, grilles and registers just prior to project final completion.

END OF SECTION 23 30 00

This page intentionally left blank

SECTION 23 34 00
HVAC FANS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide Fans as specified herein and shown on the Drawings.

B. Equipment capacity and size as indicated in the equipment lists on the Drawings.

C. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Air Handling Equipment: Rated in accordance with AMCA certified rating procedures and AMCA labeled.

1.03 SUBMITTALS

A. Submit catalog data, construction details and performance characteristics for each fan.

B. Submit operating and maintenance data.

PART 2 PRODUCTS

2.01 EXHAUST FANS AND UNITS

A. Ceiling Cabinet Exhaust Fan: Direct drive, forward curved centrifugal wheel with dynamically balanced DC motor rated for continuous operation, motor and wheel isolated from unit on vibration isolators. Provide grille on inlet and duct connection with backdraft damper on discharge. Fan designed for 2 speed operation with adjustable low speed. Include timer switch to increase fan to high speed. HVI certified and listed for installation over a bathtub or shower with GFCI circuit protection. Provide with radiation damper IC rated. Energy Star qualified. Size and capacity as indicated on Drawings. Maximum 0.75 sones under any operating condition. Panasonic, Air King, Broan, or approved.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and arrange equipment as shown on the Drawings and as recommended by the equipment manufacturer.

3.02 AIR HANDLING INSTALLATION

A. Installation and Arrangement: Air handling equipment shall be installed and arranged as shown on the Drawings. Comply with the manufacturer's recommendations for installation connection and start-up.

3.03 CONTROLS

A. Wiring: All wiring shall be in accordance with the National Electrical Code and local electrical codes.

END OF SECTION 23 34 00

This page intentionally left blank

SECTION 23 80 00
TERMINAL HVAC EQUIPMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide Heating, Cooling, and Ventilating Equipment as specified herein and shown on the Drawings.

B. Equipment capacity and size shall be as indicated on the Drawings.

C. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Air Handling Equipment: Rated in accordance with AMCA certified rating procedures and AMCA labeled.

B. Air Conditioning and Refrigeration Equipment Rating: Rated in accordance with ARI certified rating procedures and ARI labeled.

C. Gas-fired Equipment: Design certified by American Gas Association.

1.03 SUBMITTALS

A. Submit catalog data, construction details and performance characteristics for each HVAC unit.

B. Submit operating and maintenance data.

PART 2 PRODUCTS

2.01 TERMINAL HEATING EQUIPMENT

A. Wall mounted electric fan forced heaters: UL listed recessed heater with primary and secondary thermal safeties with secondary manual reset, nichrome heating element, recessed wall can, two stage centrifugal blower, and powder coat metal grille. Provide with remote 2-pole thermostat where indicated on the Drawings. Cadet C series, Qmark, Markel, King approved.

2.02 ENERGY RECOVERY VENTILATORS

A. Small Packaged ERV: Galvanized 22 gauge steel cabinet with painted hinged access door with pressure taps, expanded polystyrene insulation, and mounting brackets. Duct connections shall be galvanized steel with balancing and backdraft dampers in cold side ports. Fans shall be external rotor, backward inclined high static fans with thermally protected PSC motors rated for continuous operation. Filters shall be provided in outside air and exhaust airstreams. The heat exchanger core shall be low pressure drop crossflow aluminum-polymerized paper, UL 723 certified, and provide heat and moisture exchange. Controls shall include integral hi-low speed switch, terminal strip for remote controls, LED operation indicator, and 120 volt power cord. Unit shall include defrost cycle. Maximum acoustic noise power shall not exceed 68 dbA at high speed, 0.4 in. w.g. static pressure at the supply air connection port. Unit shall be HVI certified per CAS C49 and UL listed. No drain shall be required. Broan.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and arrange equipment as shown on the Drawings and as recommended by the equipment manufacturer.

3.02 AIR HANDLING INSTALLATION

A. Installation and Arrangement: Air handling equipment shall be installed and arranged as shown on the Drawings. Comply with the manufacturer's recommendations for installation connection and start-up.

B. Lubrication: All moving and rotating parts shall be lubricated in accordance with the manufacturer's recommendations prior to start-up.

3.03 CONTROLS

A. Wiring: All wiring shall be in accordance with the National Electrical Code and local electrical codes.

END OF SECTION 23 80 00

This page intentionally left blank