

**SECTION 21 05 00**

**COMMON WORK RESULTS FOR FIRE SUPPRESSION**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Mechanical sleeve seals.
  - 3. Sleeves.
  - 4. Escutcheons.
  - 5. Grout.
  - 6. Fire-suppression equipment and piping demolition.
  - 7. Equipment installation requirements common to equipment sections.
  - 8. Painting and finishing.
  - 9. Concrete bases.
  - 10. Supports and anchorages.

**1.3 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. CPVC: Chlorinated polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

#### **1.4 SUBMITTALS**

- A. Product Data: For the following:
  1. Mechanical sleeve seals.
  2. Escutcheons.
- B. Welding certificates.

#### **1.5 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### **1.7 COORDINATION**

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

**2.2 PIPE, TUBE, AND FITTINGS**

- A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

**2.3 JOINING MATERIALS**

- A. Refer to individual Division 21 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining CPVC Plastic Piping: ASTM F 493.

**2.4 MECHANICAL SLEEVE SEALS**

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

**2.5 SLEEVES**

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

**2.6 ESCUTCHEONS**

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.

- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## **2.7 GROUT**

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## **PART 3 - EXECUTION**

### **3.1 PIPING SYSTEMS - COMMON REQUIREMENTS**

- A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.

- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    - h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw or spring clips.
    - j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    - l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves or other methods approved by engineer prior to installation for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
    - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
  2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
  3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### **3.2 PIPING JOINT CONSTRUCTION**

- A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Braze Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

### **3.3 SPRINKLERS**

- A. Resident Units
  1. Provide typical concealed "pop off" sprinkler heads where ceiling mounted units are used. Sprinkler heads shall be centered in room.
  2. Provide typical wall mounted sprinkler heads where wall mounted units are used.
  3. Provide painted or chrome escutcheon.
- B. Common Areas
  1. Provide typical concealed "pop off" sprinkler heads where ceiling mounted units are used. Where allowed by NFPA 13 or NFPA 13R (as applicable), space sprinklers at 10'-0" on center in both directions, or by other method to allow for more frequent locations to meet coordination with lights, IT, and life safety.
  2. Provide painted or chrome escutcheon
- C. Corridors
  1. Provide typical concealed "pop off" sprinkler heads where ceiling mounted units are used. Where allowed by NFPA 13 or NFPA 13R (as applicable), center sprinklers between walls and at 10'-0" on center, or other means to indicate the location will be custom and more heads will be needed.
  2. Provide painted or chrome escutcheon.
- D. Back-Of-House Areas
  1. Provide typical surface-mounted ceiling heads, spaced at the maximum distance allowed by NFPA 13 or NFPA 13R (as applicable).
  2. Provide painted or chrome escutcheon.

### **3.4 PAINTING**

- A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.



**3.5 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

**3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

**3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

**3.8 GROUTING**

- A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.

- G. Place grout around anchors.
- H. Cure placed grout.

**END OF SECTION 21 05 00**

**SECTION 21 10 00**

**AUTOMATIC SPRINKLER SYSTEMS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Extent of Automatic Sprinkler Fire Extinguishing System Work required by this section is indicated on Drawings, by requirements of this section and as required.
- B. This section includes design and provisions of an Automatic Sprinkler Fire Extinguishing System. Types of Fire Extinguishing Automatic Sprinkler Systems specified in this section include the following:
  - 1. Wet Pipe System
  - 2. Dry Pipe Systems

**1.2 REFERENCES**

- A. NFPA 13 - Installation of Sprinkler Systems.

**1.3 DESIGN CRITERIA**

- A. System to provide coverage for entire building.
- B. Interface system with building fire and smoke alarm system.
- C. Design systems to the occupancy requirements of NFPA 13 with amendments and requirements, and the Owners Insurance Underwriter if more stringent.
- D. Provide fire department connection.
- E. Provide detailed shop drawings of the automatic sprinkler systems in accordance with NFPA 13.
- F. Provide hydraulic calculations of the automatic sprinkler systems in accordance with NFPA 13. Hydraulic calculations shall not exceed 90 percent of the available pressure.

**1.4 QUALITY ASSURANCE**

- A. Conformance with applicable state and local codes and ordinances.
- B. Equipment and Components: Bear FM label or marking.
- C. Specialist Firm: Company specializing in sprinkler systems design and installation, Licensed Fire Protection Contractor by the Department of Insurance with minimum three years experience.

**1.5 REGULATORY REQUIREMENTS**

- A. Design and install in accordance with NFPA 13 and the requirements of Owner's Insurance Underwriter or Insurance Service Office, if more stringent.
- B. Pipe sizes as shown on the drawings are minimum pipe sizes. Contractor shall increase those pipe sizes if calculations so require at no additional cost, but under no circumstance shall pipe sizes be decreased.
- C. Contractor to supply a complete sprinkler package not limited to the items included in this specification.
- D. Sprinkler contractor to design and provide an automatic sprinkler system in accordance with the NFPA 13.
- E. Sprinkler contractor to hydraulically calculate the system based on the results of an on site flow test. The calculations to be based on ordinary hazard occupancy.
- F. Where applicable conceal all piping above ceilings, in walls or chases as needed and install semi recessed pendant head. All piping to be installed as high as possible above the ceiling. Provide drains, inspector test stations, flow and tamper switches and pipe supports as required by the system and NFPA. The sprinkler system and the related component will match the existing systems within the existing building as to the materials used. Contractor to verify the acceptable location of each inspector test station with the owner prior to installation, if drain is routed to outside it will be terminated on a splash block to prevent erosion.

**1.6 SUBMITTALS**

- A. Prior to submittal to Architect/Engineer submit shop drawings, product data, and hydraulic calculations to local Fire Marshal and/or Owner's Insurance Underwriter or Insurance Services Office for approval. Contractor shall be responsible for all costs for approval process.
- B. After approval from local Fire Marshal and Owner's Insurance Underwriter or Insurance Services Office submit shop drawings, product data and hydraulic calculations to Architect/Engineer (with Certificate of Approval from local Fire Marshal and Owner's Insurance Underwriter or Insurance Services Office) for approval in accordance with Division 01.
- C. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.
- D. Submit certificates as listed below to Architect/Engineer in accordance with Division 01.
  - 1. Test Certificate of Approval for equipment and system operation.

**1.7 PROJECT RECORD DOCUMENTS**

- A. Submit documents in accordance with Division 01.

**1.8 OPERATION AND MAINTENANCE DATA**

- A. Submit manufacturer's operation and maintenance data under provisions of Division 01.
- B. Include written maintenance data on components of system, servicing requirements, and Record Drawings.

**1.9 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store equipment in shipping containers with labeling in place under provisions of Division 01.

**1.10 EXTRA STOCK**

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide metal storage sprinkler head and wrench cabinet in location designated.

**PART 2 - PRODUCTS**

**2.1 PIPING MATERIALS**

- A. See Fire Protection Piping section.

**2.2 ALARM CHECK VALVE**

- A. Alarm Check Valve: Automatic flow detector with alarm circuits, pressure switch, retard chamber, and water motor alarm gong.

**2.3 DRY-PIPE VALVE**

- A. Dry-pipe valve: Valves shall be equipped to give a local low-air pressure signal at 65 percent of the normal air pressure carried in the system. Valves shall be provided with standard trimming, including priming connection, water- and air-pressure gauges, pressure switches, priming water-level test facilities, alarm testing bypass, accelerator, and all necessary pipe, fittings, and accessories required to provide a complete installation.

**2.4 AIR SUPPLY SYSTEM**

- A. Air supply systems for dry pipe system shall be provided from new air compressor.
- B. Air Compressor: Single-stage air-cooled type, designed to maintain the required pressure on the system. Motor shall be capable of operating the compressor at rated capacity continuously without exceeding the nameplate rating and shall be provided with thermal-overload protection. Motor control shall be provided with an adjustable pressure switch to automatically start and stop the motor at required.
- C. Drum Drips: Drum drips shall be installed in accordance with NFPA 13. The installation shall be so made that the sprinkler system is not impaired while condensate is being removed from the piping.

**2.5 FIRE DEPARTMENT CONNECTIONS**

- A. Fire Department Connection (FDC): Cast brass body, rough chrome-plated brass finish, two-way wall type, and 2-1/2 "X 4" with polished chrome-plated brass swivels. Fire department connection shall be provided with polished chrome-plated brass plugs, chains, 18 inch sleeve and round plate lettered "Auto-Spkr". Threading on inlets of fire department connection shall be same as Municipal Fire Department threads.

**2.6 SPRINKLER HEADS**

- A. Suspended Ceiling Type:
  - 1. Semi-recessed "Standard" pendent type with chrome-plated finish and matching escutcheon.
  - 2. For dry-pipe system installations, provide "dry" pendent type as specified above.
  - 3. In all electrical rooms provide institutional vandal resistant pendant type sprinkler heads with nickel-plated conical escutcheon.
- B. Exposed Area Type: Standard upright type with chrome finish.
- C. Fusible Link: Temperature rated for specific area hazard.
- D. Guards: Finish to match sprinkler head.

**2.7 ELECTRIC SWITCHES**

- A. Alarm switch:
  - 1. Vane type, 24 VDC, adjustable retard (wet system only).
  - 2. Pressure Type, Snap Action, NEMA 4 construction, 5 psi to 15-psi adjustment range, 24 VDC (dry system only). Designed to activate alarm on increase in pressure.
- B. Supervisory switch:
  - 1. OS&Y gate valve type, 24 VDC.
  - 2. Pressure switch: 24 VDC.

**2.8 ALARM BELL**

- A. Exterior Alarm Bell: Electric 10" diameter, weatherproof, 97 dB at 10'-0", 24 VDC, marked "Sprinkler Alarm".
- B. Interior Alarm Bell: Electric 6" diameter, 93 dB at 10'-0", 24 VDC, marked sprinkler alarm.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Coordinate Work of this Section with other affected work.

**3.2 INSTALLATION**

- A. Installation shall be in accordance with NFPA 13 as outlined below:
  - 1. Assisted Living mixed occupancies (Type I-1 & A)
    - a. NFPA 13.
    - b. Provide heads in attic.
- B. Locate fire department connection in accordance with authority having jurisdiction. With sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handles.
- C. Locate exterior alarm bell on outside building wall next to riser.
- D. Place pipe runs to minimize obstruction to other work.
- E. Place piping in concealed spaces above finished ceilings.
- F. Center heads in two directions in 2' -0 "X 2' -0" ceiling tile and provide piping offsets as required.
- G. Apply strippable tape or paper cover to ensure sprinkler heads do not receive field paint finish.
- H. Provide excavation, bedding, backfilling and compaction in accordance with Section 15018 for work in this section.
- I. Provide 3/4-inch ball drip at low point of fire department connection and pipe to floor drain or through exterior wall. Provide one cubic foot of 3/4-inch washed rock around ball drip.
- J. Dry sprinkler systems located in areas with ceilings shall be concealed with dry pendent type sprinkler heads.

**3.3 SYSTEM TESTS**

- A. Test dry pipe system, wet pipe system, alarm switches, supervisory switches, water motor gongs or electric alarm bells, and interfacing with building fire and smoke alarm system to ensure proper operation. Tests shall be performed in accordance with the City Fire Marshal, Insurance Office Services and NFPA 13.
- B. Tests shall be witnessed and approved by local Fire Marshal and Architect/Engineer.
- C. After completion and approval of testing submit "Test Certificate of Approval" for dry pipe system, wet pipe system, alarm switches, supervisory switches, water motor gongs or electric alarm bells stating that all test results are satisfactory. Contractor, local Fire Marshal, Owner's Insurance Underwriter, Insurance Office Services and Architect/Engineer must sign certificate of Approval.

**3.4 DEMONSTRATION OF SYSTEM AND EQUIPMENT**

- A. Prior to final acceptance, Contractor shall provide a minimum of 4 hours (or as long as required by the Owner) to demonstrate to the Owner the proper operation of the automatic sprinkler system including associated accessories and controls.
  
- B. After completion and approval of demonstrations, submit "Demonstration Certificates of Completion" for automatic sprinkler system including all associated accessories and controls stating that the Demonstrations of the systems are satisfactory. The manufacturer's Representative, Contractor, Owner and Architect/Engineer must sign certificates.

**END OF SECTION 21 10 00**



**SECTION 21 11 00**

**FIRE PROTECTION PIPING**

**PART 1-GENERAL**

**1.1 SUMMARY**

- A. Extent of Fire Protection Piping Work required by this section is indicated on drawings, by requirements of this section and as required.
- B. This section includes pipe, fittings and valves for Fire Protection Systems. Types of Fire Protection Piping Systems specified in this section include the following:
  - 1. Automatic Sprinkler Systems.
  - 2. Standpipe and Hose Systems.

**1.2 REFERENCES**

- A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
- B. ANSI/ASME B16.3 - Malleable Iron Thread Fittings, Class 150 and 300.
- C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.
- D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.
- E. ANSI/ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings.
- F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welded and Threaded.
- G. ANSI/ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.
- H. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- I. ANSI/ASME B16.25 - Buttwelding Ends.
- J. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.
- K. ANSI/ASME Section 9 - Welding and Brazing Qualifications.
- L. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.
- M. ANSI/ASTM A47 - Malleable Iron Castings.
- N. ANSI/ASTM B32 - Solder Metal.
- O. ANSI/AWS A5.8 - Brazing Filler Metal.
- P. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.

- Q. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugal Cast.
- R. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.
- S. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- T. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- U. ASTM B75 - Seamless Copper Tube.
- V. ASTM B88 - Seamless Copper Water Tube.
- W. ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.
- X. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.
- Y. NFPA 13RR - Installation of Sprinkler Systems.
- Z. NFPA 24 - Private Fire Service Mains and their Appurtenances.

### 1.3 QUALITY ASSURANCE

- A. Conformance with applicable state and local codes and ordinances.
- B. Welding Materials and Procedures: Conform to ASTM Code.
- C. Employ certified welders in accordance with ANSI/ASME Section 9.
- D. Valves: Bear FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

### 1.4 REGULATORY REQUIREMENTS

- A. Install in accordance with NFPA 13R and the requirements of Owner's Insurance Underwriter or Insurance Services Office.
- B. Piping materials specified herein are acceptable products to the Architect/Engineer but all are not necessarily acceptable to applicable local codes or ordinances. It is the responsibility of the Contractor to provide materials, from the options listed herein, that are acceptable to both the Architect/Engineer and applicable local codes and ordinances.
- C. Pipe sizes as shown on the drawings are minimum pipe sizes. Contractor shall increase those pipe sizes if calculations so require, but under no circumstance shall pipe sizes be decreased.

### 1.5 SUBMITTALS

- A. Prior to submittal to Architect/Engineer submit shop drawings, product data, and hydraulic calculations to local Fire Marshal and Owner's Insurance Underwriter or Insurance Services Office for approval.

- B. After approval from local Fire Marshal and Owner's Insurance Underwriter or Insurance Services Office, submit shop drawings, product data, and hydraulic calculation to Architect/Engineer (with Certificate of Approval from local Fire Marshall and Owner's Insurance Underwriter or Insurance Services Office) for approval in accordance with Division 01.
- C. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.
- D. Indicate valve data and ratings.
- E. Submit certificates as listed below to Architect/Engineer in accordance with Division 01.
  - 1. Test Certificate of Approval for Piping System.

## **PART 2 - PRODUCTS**

### **2.1 PIPE, FITTINGS, AND VALVES**

- A. All exterior below ground piping shall be ductile iron pipe (AWWA C151). Fittings shall be ductile iron, 250 pound rated, mechanical joint (AWWA C110). Joints shall be mechanical joint or push-on (AWWA C111). Both pipe and fittings shall be tar coated outside and cement-mortar lined inside (AWWA C104).
- B. System design pressure is 175 psig.
- C. Provide piping and valve identification in accordance with other sections.

### **2.2 PRESSURE REDUCING VALVE**

- A. Pressure reducing valve shall maintain a constant downstream pressure regardless of fluctuations in demand and/or inlet pressure. It shall be a hydraulically operated, pilot controlled, diaphragm type globe valve.
- B. The main valve shall have a single removable seat and a resilient disc with a rectangular cross-section which shall be retained on three and one-half sides to assure that the disc will be held firmly in place under such high differential pressure conditions that may develop across the seating area. No "O" ring type disc will be permitted. The stem shall be guided at both ends by a bearing in the valve cover and an integral bearing in the sufficient diameter to withstand high hydraulic pressures, also it must be drilled and tapped in the cover end to receive and affix such accessories as may be necessary. There shall be no external packing glands permitted nor are pistons allowed in the main valve or pilot control system. The control system shall include a fixed orifice and all major components of this system shall be manufactured by the same company that manufactures the main valve. All elastomer shall be Buna-N and the main valve diaphragm shall be vulcanized at the stem hold to insure against wicking failure. The diaphragm shall not be used as the seating surface. All necessary repairs and/or modifications other than the replacement of the main valve body shall be possible without removing the main valve from the line.
- C. The pilot control shall be a direct acting adjustable, spring loaded, normally open diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting.
- D. The main valve materials shall be cast steel body with brass and bronze trim. The pilot system shall be cast brass with 303 stainless steel trim. Flange ratings shall be 300 lb. class rated for 300 psi maximum working pressure. Valve shall have internal epoxy coating applied to all wetted surfaces by the fused method process to an average thickness of 12 mils.

- E. This valve shall be UL listed - Special System Water Control Valves - Class II Guide VLMT - File No. EX2354 and File No. EX2855, C.C. No.HNFX.
- F. A direct factory representative shall provide start up service, inspection or necessary adjustments.
- G. Acceptable Manufacturer and Model:  
Cla-Val Co.                      90-21AKC

### **2.3 EXCAVATION, BACKFILLING AND COMPACTING**

- A. Provide excavation, backfilling and compacting in accordance with other sections.

### **2.4 PIPING SPECIALTIES**

- A. Provide piping specialties in accordance with other sections.

### **2.5 SUPPORTS AND ANCHORS**

- A. Provide supports and anchors in accordance with other sections.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Ream pipe and tube ends to full inside diameter.
- B. Remove burrs and bevel plain end ferrous pipe.
- C. Remove scale and foreign material, inside and outside, before assembly.

### **3.2 INSTALLATION - PIPE**

- A. Thread steel pipe joints up to and including 1-1/2 inch diameter. Thread, weld, or groove 2-inch diameter and larger, including branch connections.
- B. Mechanical Joints may be used instead of threaded or welded joints.
- C. Die-cut threaded joints with full-cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- D. Coast threaded ends with pipe lubricant compound.
- E. In steel piping, main sized saddle branch connections or direct connection of branch lines to mains is permitted if main is two pipe sizes larger than the branch. Do not project branch pipes inside the main pipe.
- F. Solder or braze copper tubes.

- G. Install piping in accordance with NFPA 13 and all TxDADS amendments and requirements, for sprinkler systems.
- H. Do not penetrate or cut building structural members.
- I. Provide sleeves when penetrating floors and walls in accordance with other sections.
- J. Seal pipe and sleeve penetration to achieve fire and smoke resistance equivalent to fire and smoke separation required in accordance with other sections.
- K. Excavation, bedding, backfilling and compacting for below ground piping in this section is specified in other sections.
- L. Fire protection water service piping below building shall be provided with both flanged joints and thrust block restraint in accordance with NFPA 24. Flange bolts and nuts shall be stainless steel. Thrust block restraint shall be provided on the below floor elbow at the base of the riser. Area of bearing face of concrete thrust block shall be a minimum of 32 square feet.
- M. Establish elevation of buried pipe outside the building to ensure not less than 3 feet of cover over top of pipe..

### **3.3 INSTALLATION - VALVES**

- A. Install valves with stems upright or horizontal, not inverted.
- B. Provide drain valves at main shut-off valve and after all zone valves. In addition, provide auxiliary drains at all low points.
- C. Adjust all pressure reducing valves to minimum pressures within the operating pressure range as required by NFPA 13 and requirements. Fire Department valve outlet shall not exceed 150 psig. Automatic sprinkler systems shall not exceed 100 psig.

### **3.4 CLEANING**

- A. Flush entire piping system of foreign matter in accordance with NFPA 13R and NFPA 24.

### **3.5 TESTING**

- A. Hydrostatic test entire system in accordance with local Fire Marshal, Owner's Insurance Underwriter, NFPA 13 and requirements and NFPA 24 or 1-1/2 times the operating pressure, whichever is greater.
- B. Test results shall be witnessed and approved by local Fire Marshal and Architect/Engineer, or Owner's Representative.
- C. Submit Test Certificate of Approval for Piping System stating that all test results are satisfactory. Certificate of Approval must be signed by Contractor, local Fire Marshal, Owner's Insurance Underwriter, and Architect/Engineer.

**END OF SECTION 21 11 00**