SECTION 15C

SPRINKLER SYSTEMS, FIRE PROTECTION

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1 Federal Specifications (Fed. Spec.):

GG-G-76E & Am-1	Gages, Pressure and Vacuum, Dial Indicating (for Air, Steam, Oil, Water, Ammonia, Chloro-Fluoro Hydrocarbon Gases, and Compressed Gases)
HH-P-46E	Packing; Asbestos, Sheet, Compressed
QQ-C-40 & Am-2	Calking: Lead Wool and Lead Pig
WW-P-421D	Pipe, Cast Gray and Ductile Iron, Pressure (for Water and Other Liquids)
WW-P-521G	Pipe Fittings, Flange Fittings, and Flanges: Steel and Malleable Iron (Threaded and Butt-Welding) Class 150
WW-V-51F	Valve, Angle, Check, and Globe, Bronze (125, 150 and 200 Pound) Threaded End, Flange Ends, Solder Ends, and Brazed End, for Land Use
WW-V-54D & Int Am-3	Valve, Gate, Bronze (125, 150 and 200 Pound, Threaded Ends, Flange Ends, Solder End and Brazed Ends, for Land Use)
WW-V-58B	Valves, Gate, Cast Iron; Threaded and Flanged (for Land Use)

1.2 Federal Standard (Fed. Std.):

H28 & Suppl 1A	Screw-Thread Standards for Federal Services

1.3 American National Standards Institute, Inc. (ANSI) Standards:

A21.4-1980	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water
A21.6-1980	Gray-Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids

A21.8-1975	Cast-Iron Pipe Centrifugally Cast in Sand-Lined Molds, for Water or Other Liquids
A21.11-1980	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
A21.51-1976	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
B16.1-1975	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800
B16.4-1977	Cast Iron Threaded Fittings Class 125 and 250
B16.18-1978	Cast Copper Alloy Solder-Joint Pressure Fittings
B16.22-1980	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
B18.2.1-1981	Square and Hex Bolts and Screws Inch Series
B18.2.2-1972	Square and Hex Nuts
B112.1-1970	Hose Valves for Fire Protection Service

1.4 American Society for Testing and Materials (ASTM) Publications:

A 120-82	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
A 135-79	Electric-Resistance-Welded Steel Pipe
A 307-82a	Carbon Steel Externally Threaded Standard Fasteners
A 325-82	High-Strength Bolts for Structural Steel Joints
A 575-81	Steel Bars, Carbon, Merchant Quality, M-Grades
A 576-81	Steel Bars, Carbon, Hot-Wrought, Special Quality
B 32-76	Solder Metal

B 75-81a	Seamless Copper Tube
B 88-81	Seamless Copper Water Tube
B 251-81	Wrought Seamless Copper and Copper-Alloy Tube

American Water Works Association (AWWA) Standards:

B300-80	Hypochlorites
B301-81	Liquid Chlorine
C110-82	Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
C200-80	Steel Water Pipe 6 In. and Larger
C207-78	Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In.
C500-80 & Correction	Gate Valves, 3 Through 48 In. NPS, for Water and Sewage Systems

American Welding Society (AWS) Publication:

A5.8-81	Specification for Brazing Filler Metal

Factory Mutual System (FM) Publication:

Approval Guide (Equipment, Materials, Services for Conservation of Property) 1982 with Quarterly Supplements

1.8 National Fire Protection Association (NFPA) Standards:

No. 13-1980	Installation of Sprinkler Systems
No. 14-1980	Standpipe and Hose Systems
No. 15-1979	Water Spray Fixed Systems for Fire Protection
No. 24-1981	Installation of Private Fire Service Mains and Their Appurtenances

Underwriters Laboratories, Inc. (UL) Publication:

Fire Protection Equipment Directory (Jan 1982 with Quarterly Supplements)

2. GENERAL REQUIREMENTS:

2.1 Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products.

2.2 Nameplates: Pumps and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.3 Verification of Dimensions: The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

2.4 Welding: Welding shall be in accordance with NFPA No. 13. Only shop welding with appropriate welding fittings shall be used.

3. SUBMITTALS:

3.1 Shop Drawings: Shop drawings shall be submitted in accordance with the SPECIAL PROVISIONS and shall consist of illustrations, schedules, performance charts, instructions, brochures, diagrams and complete shop drawings of the sprinkler system and any other information required to illustrate the system has been coordinated and will function as a unit. Shop drawings shall conform to the requirements established for working plans as prescribed in NFPA No. 13. Except as otherwise specified or shown, the sprinkler system shall be designed in accordance with NFPA No. 13. The Contractor's submittal must be signed by a registered Fire Protection Engineer or a register Professional Engineer with a fire protection background and who has had at least two years experience in fire protection design. Qualifications shall be submitted to and approved by the Contracting Officer.

3.2 Spare Parts Data: After approval of the shop drawings, and not later than 2 months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of materials and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

3.3 Operating and Maintenance Instructions:

3.3.1 Operating instructions outlining the step-by-step procedures required for system start-up, operation, and testing shall be furnished. The instructions shall include the manufacturer's name, model number, catalog cuts, diagrams, drawings, parts list, and descriptive data covering the proper operator and testing.

3.3.2 Maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs shall be furnished. The instructions shall include simplified diagrams for the system as installed.

3.3.3 Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior

to posting. The framed instructions shall be posted before acceptance testing of the systems. The framed instructions shall be posted at each alarm-check valve.

3.4 Performance Test Reports: Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

4. DELIVERY AND STORAGE: All equipment placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust or other contaminants.

5. MATERIALS: Materials and equipment shall conform to the respective publications and other requirements specified herein.

Bolts and Nuts:

5.1.1 Squarehead Bolts and Heavy Hexagon Nuts: ANSI B18.2.1 and B18.2.2 and ASTM A 307, A 575, or A 576.

5.1.2 Bolts, Underground: ASTM A 325.

5.2 Brazing Filler Metal: AWS A5.8, Classification BCuP-3 or BCuP-4.

Calking Lead: Fed. Spec. QQ-C-40, Type I.

Chlorine, Liquid: AWWA B301.

5.5 Flange Dimensions: ANSI B16.1 or AWWA C207.

Gages: Fed. Spec. GG-G-76, Class 1, Type I, Style X.

Gaskets:

5.7.1 Flange Gaskets: Fed. Spec. HH-P-46, Class 1.

5.7.2 Underground gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used.

5.7.3 Gaskets for cast-iron and ductile-iron pipe joints shall conform to ANSI A21.11.

5.8 Hypochlorites: AWWA B300.

5.9 Indicator Posts: Posts shall conform to UL requirements or as listed in FM Approval Guide.

Lubricant:

5.10.1 Gasket lubricant shall be as recommended by the pipe manufacturer.

5.10.2 Thread-cutting oil shall be an all-purpose lubricant free from animal or vegetable compounds.

5.11 Pipe:

5.11.1 For Underground Installation:

5.11.1.1 Cast Iron Pipe: Fed. Spec. WW-P-421, Type II or Type III, working pressure not less than 150 psi, ANSI A21.6 or A21.8, with cement-mortar lining conforming to ANSI A21.4.

5.11.1.2 Ductile Iron Pipe: ANSI A21.51, working pressure not less than 150 psi unless otherwise shown or specified. Pipe shall be cement-mortar-lined.

5.11.2 For Aboveground Installation:

5.11.2.1 Copper Tubing: ASTM B 75 and ASTM B 88, of copper Nos. 102, 103, and 108. ASTM B 75 tube meeting the requirements of ASTM B 251 will be acceptable only in drawn or hard drawn and must meet the mechanical property requirements of Table 2 in ASTM B 88, the roundness tolerance of Table 3, the dimensional requirements of Table 4, with wall thickness to type K, L, or M equivalent, and length to Table 5. Tube conforming to ASTM B 88 shall be type K, L, or M.

5.11.2.2 Steel Pipe: ASTM A 120, Schedule 40, and AWWA C200. Electric-resistance welded steel pipe shall conform to ASTM A 135 and wall thickness shall comply with NFPA No. 13.

5.12 Pipe Fittings:

5.12.1 For Underground Installation: Cast gray iron or cast ductile iron pipe fittings shall conform to AWWA C110 or ANSI B16.1.

5.12.2 For Aboveground Installation: Fittings shall be cast iron or malleable iron for steel pipe and brazed or soldered cast or wrought bronze or wrought copper for copper pipe.

5.12.2.1 Cast iron fittings shall conform to AWWA C110 or ANSI B16.1 and ANSI B16.4, type to match adjacent piping.

5.12.2.2 Malleable-iron fittings shall conform to Fed. Spec. WW-P-521, type to match adjacent pipings.

5.12.2.3 Cast copper alloy pressure fitting shall conform to ANSI B16.18 and wrought copper and bronze pressure fittings shall conform to ANSI B16.22.

5.13 Pipe Hangers: Hangers shall be in accordance with NFPA No. 13, and in accordance with UL requirements for use in sprinkler systems except that "C" clamp supports on beams are not allowed.

5.14 Solder Metal: ASTM B 32, 95-5 (tin-antimony-grade 95TA).

Valves:

5.15.1 Gate Valves: Under 2-inch size valves shall be in accordance with Fed. Spec. WW-V-54; 2-inch to 3-inch size, valves shall conform to the requirements of Fed. Spec. WW-V-54 or WW-V-58; above 3-inch size, valves shall meet the requirements of Fed. Spec. WW-V-58 or AWWA C500.

5.15.2 Check Valves: Under 3-inch size valves shall meet the requirements of Fed. Spec. WW-V-51. Valves 3-inch and larger shall be iron body, bronze-mounted. All valves shall be listed in UL Fire Protection Equipment Directory or FM Approval Guide and shall be straightway type, suitable for vertical or horizontal installation with end connections as required to mate with piping in which the valve must be installed.

5.15.3 Hose Valves: ANSI B112.1, all brass or bronze, straightway pattern.

6. ELECTRICAL WORK: Electric Equipment and wiring shall be in accordance with SECTION: ELECTRICAL WORK, INTERIOR. Conduit, wiring, control, signal devices, and all associated equipment required for the operations herein specified, shall be provided under this section of the specifications.

7. INSTALLATION:

7.1 Installation: Installation shall be in accordance with NFPA No. 13 unless specified otherwise herein. Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. The system shall be installed by an experienced firm regularly engaged in the installation of fire-protection sprinkler systems in accordance with NFPA standards. The Contracting Officer may reject any proposed installer who cannot show evidence of such qualifications. Contracting Officer's approval will not relieve the Contractor from his responsibilities to perform all work in accordance with specifications and contract terms.

7.2 Personnel Protection: Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts, shall be so located as to be fully inclosed or guarded to prevent a person coming in contact therewith.

8. PIPE AND FITTINGS:

Underground Pipe and Fittings:

8.1.1 Pipe Installation: The sprinkler-system supply line shall be laid below the local frostline. Depths of cover over water lines shall be in accordance with NFPA No. 24. Connection to the water-supply main shall be performed as directed by the Contracting Officer in order to mininmize the inconvenience resulting from water-service interruption. Where connection of the sprinkler supply line to the water supply main cannot be made immediately, the sprinkler supply line shall be extended 5 feet outside of building, and capped. Change in direction of pipe shall be made with suitable standard fittings, except that deflections from a straight line

will be permitted provided such deflections in either the horizontal or the vertical plane do not exceed 6/D inches per linear foot for pipe less than 14 inches in nominal diameter, or 4.5/D inches per linear foot for pipe 14 inches and larger in diameter, where D represents the nominal diameter of the pipe expressed in inches, between the extended centerlines of any two connecting pipes. The supply line shall terminate inside the building or valve house with a special flanged piece, with the bottom of the flange set not less than 4 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. Fittings shall have joints and pressure-class ratings compatible with the pipe used, all conforming to NFPA No. 24.

8.1.2 Joints: Joints shall be of the mechanical, single-gasket, push-on, or bell-and-spigot type. Each joint shall be made in a manner approved by the Contracting Officer. All joints shall be left exposed until final inspection and tests have been made. Bell-and-spigot joints shall be made by carefully centering the spigot in the bell. Calking lead, approved joint compounds, or approved rubber gaskets without calking where bell end of pipe locks gasket against displacement, may be used at the option of the Contractor. Lead joints shall be poured in one continuous flow from the ladle. Each joint requiring calking shall be calked at least three times around, using the proper-size calking irons. Mechanical joints shall be of the stuffing-box type and mechanical and push-on joints shall conform to ANSI A21.11.

8.1.3 Bracing and Clamping: Bends, plugs, and tees shall be braced or clamped in accordance with the requirements of NFPA No. 24. The connection between the underground piping and the base of the riser shall be anchored by means of tie rods and pipe clamps.

8.1.4 Control Valves: Valves shall conform to UL requirements and shall be gate valves with indicator posts, outside screw-and-yoke gate valve in pits, installed in accordance with NFPA No. 24.

8.1.5 Excavation, Trenching, and Backfilling: Earthwork shall be performed in accordance with applicable requirements of SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

8.1.6 Flushing: Before connecting sprinkler system to underground supply connections, each supply connection shall be flushed out thoroughly in accordance with requirements of NFPA No. 13.

8.2 Aboveground Pipe and Fittings:

8.2.1 Pipe: Pipe used shall not be subject to a working pressure in excess of 25 percent of the hydrostatic pressure test required by ASTM A 120.

8.2.2 Joints: Joints shall conform to NFPA No. 13. Shop welded joints will be permitted. Flanged joints or mechanical grooved couplings shall be provided where indicated or required by NFPA No. 13.

8.2.2.1 Threaded joints shall be cut with an approved thread-cutting oil and shall conform to Fed. Std. H28. Joints shall be made tight with a stiff mixture of litharge and glycerin or other approved thread-joint compound or tape. Not more than three threads shall show after the joint is made up.

8.2.2.2 Flanged joints shall be faced true, provided with 1/16-inch asbestos gaskets in accordance with Fed. Spec. HH-P-46, and made square and tight.

8.2.3 Special couplings, grooved couplings, and flexible connections approved for use in sprinkler systems may be used in place of unions and flanged connections where applicable.

8.2.4 Fittings: Fittings for aboveground piping shall be of a type specifically approved for use in sprinkler systems. Bushings shall be used only where standard fittings of the required size are not available. The use of bushings is further restricted to requirements of NFPA No. 13.

8.2.5 Reducers: Reductions in pipe sizes shall be made with one-piece reducing fittings. Bushings will not be acceptable, except that when standard fittings of the proper size are not available, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

8.2.6 Pipe Supports and Hangers: The recommended methods and requirements for supporting of hanging pipe as set forth in NFPA No. 13 shall be mandatory.

8.2.7 Pipe Sleeves: Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted into place at the time of construction. All rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective wall or floor, and be cut flush with each surface. Unless otherwise indicated, sleeves shall be of such size as to provide a minimum of 1/4-inch all-around clearance between the pipe and sleeve. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be steel pipe or cast iron pipe. Sleeves in nonbearing walls, floors, or ceilings may be steel pipe, cast iron pipe, or galvanized sheet metal with lock-type longitudinal seam.

8.2.7.1 In addition to the pipe sleeves referred to above, pipes through floor waterproofing membrane shall be provided with a 4-pound lead flashing or a 16-ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches above the floor. The annular space between the flashing and the pipe shall be sealed as indicated. At the Contractor's option, pipes passing through floor water-proofing membrane may be installed through a cast iron sleeve with calking recess, anchor lugs,

flashing-clamp device, and pressure ring with brass bolts. Waterproofing membrane at floors shall be clamped into place and sealant shall be placed in the calking recess.

8.2.7.2 Pipes passing through wall waterproofing membrane shall be sleeved as described above. In addition, a waterproofing clamping flange shall be installed as indicated.

8.2.7.3 Where pipes pass through fire walls, fire partitions, or floors, a fire seal of asbestos rope, mineral wool, or similar noncombustible material shall be placed between the pipe and sleeve. Penetrations shall be as detailed and located where indicated.

8.2.8 Escutcheons: Escutcheons shall be provided at all finished surfaces where exposed piping passes through floors, walls, or ceilings except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe and shall be chromium-plated iron or chromium-plated brass, either one-piece or split-pattern, held in place by internal spring tension or setscrew.

8.3 Drains: The sprinkler system shall be provided with complete drainage facilities as indicated and in accordance with NFPA No. 13.

8.4 Protection Against Freezing: Supply pipes or risers that pass through unheated spaces in or under buildings and are exposed to freezing shall be protected from freezing as indicated or in accordance with applicable methods in NFPA No. 13.

8.5 Protection of Piping in Seismic Zones: Protection of piping against earthquake damage shall be a site specific requirement. Methods of protection shall be in accordance with applicable requirements of NFPA No. 13 and Appendix A.

9. SPRINKLERS: Sprinklers shall conform to the UL Fire Protection Equipment Directory for required application and pendent, as indicated. Automatic and open-type sprinklers shall be placed upright unless otherwise indicated, with the deflector parallel to the ceiling or slope of the roof. Clearances between deflectors and ceiling, roof decking, roof joists, and electric or heating equipment or other obstructions shall be in accordance with NFPA No. 13.

9.1 Automatic-Open Sprinklers: Sprinklers shall be automatic-open type with 1/2-inch nominal size orifice. Temperature ratings of fusible elements shall be in accordance with NFPA No. 13. Automatic sprinklers of standard temperature rating shall be used, except in areas where above-normal temperatures will occur. In such areas of above-normal temperatures, high-temperature sprinklers suitable for the temperature condition shall be provided.

9.2 Spare Sprinklers: The Contractor shall furnish spare automatic sprinklers in accordance with the requirements of NFPA No. 13 for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each

type and temperature rating of the sprinklers installed. The Contractor shall furnish no less than two special sprinkler-head wrenches, or at least one head wrench for each container or sprinkler box, whichever is greater.

10. FIRE-DEPARTMENT CONNECTIONS: Fire-department connections shall be in accordance with NFPA No. 13 where indicated. Connections shall include check valve, automatic drip, caps, chains, and nameplate, so located that connections will not be subject to freezing. The discharge from the automatic drip shall be visible. Fire-department connections shall be single type with 2-1/2 inch outside diameter and shall be provided with National Standard fire-hose thread connections. Where base equipment has different type of connection, suitable adapters shall be provided to match the base equipment.

11. ALARM CHECK VALVES: Alarm check valves shall be provided with standard trimmings including pressure gages, retarding chamber, alarm switch, testing bypass, and all necessary pipe, fittings, and accessories required for a complete trimming installation, in accordance with NFPA No. 13.

12. DISINFECTION: Before acceptance of the sprinkler system, each unit of the completed system shall be disinfected as specified. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph MATERIALS. The chlorinating material shall provide a dosage of not less than 50 ppm and shall be introduced into the sprinkler lines in an approved manner. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 ppm of chlorine throughout the line at the end of the retention period. All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 ppm. From several points in the unit, the Contacting Officer will take samples of water in properly sterilized containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of pollution for at least 2 full days.

13. ALARM FACILITIES: Equipment necessary to accomplish a local waterflow alarm signal for each system, one transmitted coded water flow signal for each system, and a local trouble alarm for each supervisory system shall be installed in each sprinkler system.

13.1 Local Waterflow Alarm Facilities: Facilities shall consist of an outside water motor gong mounted where indicated. Electric power supply required for local alarms shall be taken from the house-current supply line on the line side of the main switch through an independent switch and fuse block or circuit breaker, as indicated.

13.2 Transmission of Alarm Signals: Alarm signal wiring shall be connected to the building fire alarm control in accordance with SECTION: FIRE DETECTION AND ALARM SYSTEM.

14. FIELD PAINTING AND FINISHING are specified in SECTION: PAINTING. GENERAL.

15. TESTS: Upon completion and prior to acceptance of the installation, the Contractor shall subject the system, including the underground supply connection, to the tests required by NFPA No. 13, and shall furnish the Contracting Officer with a certificate as required. Systems or portions of systems using open-sprinkler heads, where conditions permit the discharge of water, shall be flow-tested in the presence of the Contracting Officer or his authorized representatives, prior to acceptance.