
USACE / NAVFAC / AFCEA / NASA UFGS-21 13 00.00 20 (April 2006)

Preparing Activity: NAVFAC Replacing without change
UFGS-13930N (September 1999)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 19 March 2007

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DIVISION 21 - FIRE SUPPRESSION

SECTION 21 13 00.00 20

WET-PIPE FIRE SUPPRESSION SPRINKLERS

04/06

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SECTION 21 13 00.00 20

WET-PIPE FIRE SUPPRESSION SPRINKLERS

04/06

NOTE: This guide specification covers the requirements for automatic wet-pipe fire extinguishing sprinkler systems for heated areas.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

NOTE: System requirements must conform to Unified Facilities Criteria (UFC) 3-600-01 Design: Fire Protection Engineering for Facilities and NFPA 13, "Installation of Sprinkler Systems."

NOTE: If there are questions concerning system design, consult with the Engineering Field Division, Naval Facilities Engineering Command, Fire Protection Engineer.

NOTE: Following information shall be shown on project drawings:

1. Location and detail of each sprinkler system supply riser, alarm valve, water motor alarm, fire department inlet connection, pressure or flow switch, fused disconnect switch, and associated electrical connections.
2. Location where each sprinkler system begins including connection to water distribution system piping.
3. Location of sprinkler system control valves, post indicator valves, or wall indicator valves.
4. Area of sprinkler system coverage when system is protecting partial areas.
5. Details of anchoring piping, including pipe clamps and tie rods, or mechanical retainer glands.
6. Indicate existing sprinkler piping layout and sprinkler heads on project drawings only if existing sprinkler system is being modified and such layout is necessary for clarity.

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015

(2005) Double Check Backflow Prevention
Assemblies and Double Check Fire
Protection Backflow Prevention Assemblies

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2005; Errata 2005) Standard for
Disinfecting Water Mains

ASME INTERNATIONAL (ASME)

ASME A17.1 (2004; Addenda and Supplement 2005) Safety
Code for Elevators and Escalators

FM GLOBAL (FM)

FM P7825 (2005) Approval Guide

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCCHR)

FCCCHR List (continuously updated) List of Approved
Backflow Prevention Assemblies

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-58 (2002) Standard for Pipe Hangers and
Supports - Materials, Design and
Manufacture

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (2006) Installation of Sprinkler Systems

NFPA 24 (2006) Standard for the Installation of
Private Fire Service Mains and Their
Appurtenances

NFPA 70 (2005; TIA 2005) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 262 (2004) Standard for Gate Valves for
Fire-Protection Service

UL 789 (2004) Indicator Posts for Fire-Protection
Service

UL Fire Prot Dir (2006) Fire Protection Equipment Directory

1.2 DEFINITION

- a. Year 2000 compliant - means computer controlled facility components that accurately process date and time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations.

[1.3 SYSTEM DESCRIPTION

Design and provide [new and modify existing] automatic wet pipe fire

extinguishing sprinkler systems for complete fire protection coverage throughout [____].

]1.4 SPRINKLER SYSTEM DESIGN

NOTE: Areas smaller than 279 sq meters 3,000 sq ft, use pipe schedules. Areas larger than 279 sq meters 3,000 sq ft, use pipe schedules or hydraulic calculations. Open areas larger than 929 sq meters 10,000 sq ft, use hydraulic calculations. When hydraulic calculations are not included, delete paragraphs entitled "Water Distribution," "Density of Application of Water," "Sprinkler Discharge Area," "Outside Hose Allowances," "Friction Losses," and "Water Supply."

NOTE: Select last bracketed statement for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2. Refer to NAVFAC P-355. Coordinate with structural designer.

Design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of NFPA 13, except as modified herein, by [pipe schedules for [____] [ordinary] [extra] hazard occupancy] [or] [hydraulic calculations for uniform distribution of water over the design area]. Discharge from individual heads in the hydraulically most remote area shall be between 100 percent and 120 percent of the specified density. Each system shall include materials, accessories, and equipment inside and outside the building to provide each system complete and ready for use. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed working drawings to be submitted for approval. Locate sprinkler heads in a consistent pattern with ceiling grid, lights, and air supply diffusers. Provide sprinkler heads and piping system layout. Devices and equipment for fire protection service shall be UL Fire Prot Dir listed or FM P7825 approved for use in wet pipe sprinkler systems. [Design systems for earthquake protection.]

[1.4.1 Location of Sprinkler Heads

Heads in relation to the ceiling and the spacing of sprinkler heads shall not exceed [that permitted by NFPA 13 for [____] [ordinary] [extra] hazard occupancy.] [[____] sq meter ft per head.] Uniformly space sprinklers on the branch piping.

]1.4.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinkler heads will open. Discharge from individual heads in the hydraulically most remote area shall be 100 percent of the specified density.

1.4.3 Density of Application of Water

Size pipe to provide the specified density when the system is discharging

the specified total maximum required flow. Application to horizontal surfaces below the sprinklers shall be [_____] L/m per sq meter gpm per sq ft.

1.4.4 Sprinkler Discharge Area

Area shall be the hydraulically most remote [_____] sq meter ft area as defined in NFPA 13.

1.4.5 Outside Hose Allowances

Hydraulic calculations shall include an allowance of [_____] L/m gpm for outside hose streams.

1.4.6 Friction Losses

Calculate losses in piping in accordance with the Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.

1.4.7 Water Supply

Base hydraulic calculations on a static pressure of [_____] kPa (gage) psig with [_____] L/m gpm available at a residual pressure of [_____] kPa (gage) psig at the [junction with the water distribution piping system.] [base of the sprinkler piping riser.] [Base hydraulic calculations on operation of fire pumps provided in Section 21 30 00 FIRE PUMPS.]

1.4.8 Detail Drawings

Prepare A1 841 x 594 mm 24 by 36 inch detail working drawings of sprinkler heads and piping system layout in accordance with NFPA 13, "Working Drawings (Plans)." Show data essential for proper installation of each system. Show details, plan view, elevations, and sections of the systems supply and piping. Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams. [Submit drawings signed by a registered fire protection engineer.]

1.4.9 As-Built Drawings

After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit A1 841 x 594 mm 24 by 36 inch drawings on reproducible mylar film with title block similar to full size contract drawings. Furnish the as-built (record) working drawings in addition to as-built contract drawings required by Division 1, "General Requirements."

1.5 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only

delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[The [_____] Division, Naval Facilities Engineering Command, Fire Protection Engineer, will review and approve all submittals in this section requiring Government approval.]

NOTE: For projects administered by the Pacific Division, Naval Facilities Engineering Command, use the optional "SUBMITTALS" article immediately below and delete the general "SUBMITTALS" article above.

[The [_____] Division, Naval Facilities Engineering Command, Fire Protection Engineer delegates the authority to the Quality Control (QC) Representative's U.S. Registered Fire Protection Engineer for review and approval of submittals required by this section. Submit to the [_____] Division, Naval Facilities Engineering Command, Fire Protection Engineer one set of all approved submittals and drawings immediately after approval but no more later than 15 working days prior to final inspection.]

SD-02 Shop Drawings

Sprinkler heads and piping system layout[; G][; G, [_____]]

Electrical wiring diagrams[; G][; G, [_____]]

SD-03 Product Data

Piping[; G][; G, [_____]]

[Alarm valves[; G][; G, [____]]]
Valves, including gate, check, and globe[; G][; G, [____]]
[Water motor alarms[; G][; G, [____]]]
Sprinkler heads[; G][; G, [____]]
Pipe hangers and supports[; G][; G, [____]]
[Pressure] [or] [flow] switch[; G][; G, [____]]
Fire department connections[; G][; G, [____]]
Excess pressure pump[; G][; G, [____]]
Mechanical couplings[; G][; G, [____]]
Backflow Preventer[; G][; G, [____]]

Annotate descriptive data to show the specific model, type, and size of each item.

SD-05 Design Data

Sprinkler system design[; G][; G, [____]]

Submit [computer program generated] hydraulic calculations to substantiate compliance with hydraulic design requirements. Submit name of software program used.

SD-06 Test Reports

Preliminary tests on piping system[; G][; G, [____]]

SD-07 Certificates

Qualifications of installer[; G][; G, [____]]

Year 2000 (Y2K) Compliance Warranty

SD-10 Operation and Maintenance Data

Alarm valves, Data Package 3[; G][; G, [____]]

Excess pressure pump, Data Package 3[; G][; G, [____]]

Backflow preventer, Data Package 3[; G][; G, [____]]

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

As-built drawings of each system[; G][; G, [____]]

1.6 QUALITY ASSURANCE

1.6.1 Qualifications of Installer

Prior to installation, submit data showing that the Contractor has successfully installed systems of the same type and design as specified herein, or that Contractor has a firm contractual agreement with a subcontractor having such required experience. Data shall include names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.

Qualifications of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Automatic Sprinkler System program. Contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

1.7 WARRANTY

1.7.1 Year 2000 (Y2K) Compliance Warranty

For each product, component and system specified in this section as a "computer controlled facility component" provide a statement of Y2K compliance warranty for the specific equipment. The contractor warrants that each hardware, software, and firmware product delivered under this contract and listed below shall be able to accurately process date and time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations to the extent that other computer controlled components, used in combination with the computer controlled component being acquired, properly exchange data and time data with it. If the contract requires that specific listed products must perform as a system in accordance with the foregoing warranty, then that warranty shall apply to those listed products as a system. The duration of this warranty and the remedies available to the Government for breach of this warranty shall be defined in, and subject to, the terms and limitations of the contractor's standard commercial warranty or warranties contained in this contract, provided that, notwithstanding any provisions to the contrary, in such commercial warranty or warranties, the remedies available to the Government under this warranty shall include repair or replacement of any listed product whose non-compliance is discovered and made known to the contractor in writing within one year (365 days) after acceptance. Nothing in this warranty shall be construed to limit any rights or remedies the Government may otherwise have under this contract, with respect to defects other than Year 2000 performance.

PART 2 PRODUCTS

2.1 Y2K COMPLIANT PRODUCTS

NOTE: To ensure that buildings' systems continue to function beyond Year 2000, the following paragraph

must be included when this section is part of a construction contract. For more information on Y2K, see these web sites on the Internet.

<http://www.doncio.navy.mil/y2k/year2000.htm>, the Year 2000 homepage of the Department of the Navy Chief Information Officer (DONCIO);
<http://www.itpolicy.gsa.gov/mks/yr2000.legal.htm>, the General Services Administration (GSA) Chief Information Officer (CIO) homepage for Y2K procurement, contracting, and legal issues;
<http://y2k.lmi.org/gsa/y2kproducts> contains information on vendor product compliance.

Provide computer controlled facility components, specified in this section, that are Year 2000 compliant (Y2K). Computer controlled facility components refers to software driven technology and embedded microchip technology. This includes, but is not limited to, telecommunications switches, programmable thermostats, HVAC controllers, elevator controllers, utility monitoring and control systems, fire detection and suppression systems, alarms, security systems, traffic signals, and other facilities control systems utilizing microcomputer, minicomputer, or programmable logic controllers.

2.2 ABOVEGROUND PIPING SYSTEMS

Provide fittings for changes in direction of piping and for connections. [Make changes in piping sizes through tapered reducing pipe fittings; bushings will not be permitted.] Perform welding in the shop; field welding will not be permitted. Conceal piping in areas with [suspended ceiling] [and] [_____].

2.2.1 Sprinkler Piping

NFPA 13, except as modified herein. [Steel piping shall be Schedule [10] [or] [40] for sizes less than 200 mm 8 inches, and Schedule [10] [30] or [40] for sizes 200 mm 8 inches and larger.] Fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into the pipe when pressure is applied will not be permitted. Rubber gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted in pipe sizes 40 mm 1.5 inches and larger. Fittings shall be UL Fire Prot Dir listed or FM P7825 approved for use in wet pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. Steel piping with wall thickness less than Schedule 30 shall not be threaded. [Side outlet tees using rubber gasketed fittings shall not be permitted.] [Sprinkler pipe and fittings shall be metal.]

2.2.2 Sprinkler Heads

Provide nominal 12.7 mm 0.50 inch [or 13.5 mm 0.53 inch] orifice sprinkler heads. O-rings will not be permitted in sprinkler heads. Release element of each head shall be of the [_____] [intermediate] temperature rating or higher as suitable for the specific application. Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings. [Provide corrosion-resistant sprinkler heads and sprinkler head

guards as required by NFPA 13.] [Provide [_____] sprinkler heads [_____] [as indicated].] Deflector shall not be more than 80 mm 3 inches below suspended ceilings. Ceiling plates shall not be more than 12.7 mm 0.5 inch deep. Ceiling cups shall not be permitted.

2.2.3 Cabinet

Provide metal cabinet with extra sprinkler heads[, including a representative sample of dry pendent type sprinklers] and sprinkler head wrench adjacent to each alarm valve. The number and types of extra sprinkler heads shall be as specified in NFPA 13.

[2.2.4 Alarm Valves

Provide variable pressure type alarm valve complete with [retarding chamber,] alarm test valve, alarm shutoff valve, drain valve, pressure gages, accessories, and appurtenances for the proper operation of the system.

] 2.2.5 Water Motor Alarms

Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water in each corresponding sprinkler system. Mount alarms on the outside of the outer walls of each building at a location as directed. Provide separate drain piping directly to exterior of building.

] 2.2.6 [Pressure] [or] [Flow] Switch

Provide switch with circuit opener or closer for the automatic transmittal of an alarm over the facility fire alarm system. Connection of switch shall be under Section [28 31 73.00 20 EXTERIOR FIRE ALARM SYSTEM] [28 31 74.00 20 INTERIOR FIRE ALARM SYSTEM.] [Alarm actuating device shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.]

2.2.7 Pipe Hangers and Supports

Provide in accordance with NFPA 13. Attach to steel joists with MSS SP-58, Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor.

2.2.8 Valves

NFPA 13. Provide valves of types approved for fire service. Gate valves shall open by counterclockwise rotation. [Provide [a rising stem] [an OS&Y] [a wall indicator] valve beneath each alarm]. [Check valves shall be flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 100 mm 4 inches and larger.] [Provide OS&Y gate valve in piping to sprinklers protecting elevator hoistways, machine rooms, and machinery spaces in accordance with ASME A17.1.] [Provide double check valve assembly type backflow preventer with OS&Y gate valves on both ends. Each check valve shall have a drain. Each OS&Y gate valve shall be supervised; minimum contact ratings shall be 2.5 amps at 24 volt DC. Provide supervision against valve closure or tampering of valve. Double check valve assembly shall be tested and certified under ASSE 1015.]

2.2.9 Backflow Preventer

Provide [reduced pressure principle] [double check] valve assembly backflow preventer with OS&Y gate valve on both ends. Each check valve shall have a drain. Backflow prevention assemblies shall have current "Certificate of Approval from the Foundation for Cross-Connection Control and Hydraulic Research, [FCCCHR List](#). Listing of the specific make, model, design, and size in the [FCCCHR List](#) shall be acceptable as the required documentation."

2.2.10 Identification Signs

[NFPA 13](#). Attach properly lettered and approved metal signs to each valve and alarm device. [Permanently affix hydraulic design data nameplates to the riser of each system.]

2.2.11 Test Connections

2.2.11.1 Inspector's Test Connection for Preaction Systems

Provide test connections approximately [2 meters 6 feet](#) above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device; locate at the hydraulically most remote part of each system. Provide test connection piping to a drain location that can accept full flow where the discharge will be readily visible and where water may be discharged without property damage. [Discharge to a floor drain shall be permitted only if the drain is sized to accommodate full flow.] Discharge to janitor sinks or similar fixtures shall not be permitted. Provide discharge orifice of same size as corresponding sprinkler orifice. [The penetration of the exterior wall shall be no greater than [2 feet0.61 meter](#)] [_____] above finished grade.]

[2.2.11.2 Backflow Preventer Test Connection

Provide downstream of the backflow prevention assembly listed hose valves with [65 mm 2.5 inch](#) National Standard male hose threads with cap and chain. Provide one valve for each [250 gpm 16 L/s](#) of system demand or fraction thereof. Provide a permanent sign in accordance with paragraph entitled "Identification Signs" which reads, "Test Valve."

]2.2.12 Main Drains

Provide separate drain piping to discharge at safe points outside each building [or] [to sight cones attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure]. Provide auxiliary drains as required by [NFPA 13](#). Provide precast concrete splash block under each exterior drain discharge. [The penetration of the exterior wall shall be no greater than [2 feet0.61 meter s](#)] [_____] above finished grade.] [Main drain shall also serve as the backflow preventer test connection. Site main drain pipe and valve to support flow at system demand.]

2.2.13 Fire Department Connections

Provide [[4] [_____] [inch](#) [100] [_____] [mm](#) single [Storz] [_____] type] connections approximately [one meter 3 feet](#) above finish grade, of the approved two-way type with [65 mm 2.5 inch](#) National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.

2.2.14 Excess Pressure Pump

**NOTE: Use pump only when building water supply is
subject to extreme water pressures.**

Provide pumps on each sprinkler piping riser. Pumps shall be of the positive displacement, gear type rated at 63 mL/s one gpm, integrally mounted with motor. Pump and motor unit shall be approved for automatic wet pipe fire extinguishing sprinkler systems and shall be complete with pilot light panel, differential motor control switch, high pressure switch, and low pressure switch. Provide electrical power supply connections for pump and pilot light panel at the supply side of building service panel; provide a separate fused safety-type switch with locked lever for each connection. Provide pressure pump sensing piping in supply piping [upstream of fire pump].

2.3 BURIED WATER PIPING SYSTEMS

2.3.1 Pipe and Fittings

Provide outside-coated, cement-mortar lined, ductile-iron pipe, and fittings conforming to NFPA 24 for piping under the building and outside of building walls. Anchor joints in accordance with NFPA 24. Provide concrete thrust block at the elbow where the pipe turns up toward the floor, and restrain the pipe riser with steel rods from the elbow to the flange above the floor. Minimum pipe size shall be 150 mm 6 inches. Minimum depth of cover shall be [_____] [one meter] [3 feet] at finish grade. [Piping beyond 1.50 meters 5 feet outside of building walls shall be provided under Section 33 11 00 WATER DISTRIBUTION.]

[2.3.2 Valves

Provide as required by NFPA 24. Gate valves shall conform to UL 262 and shall open by counterclockwise rotation.

] [2.3.3 Post Indicator Valves

Provide with operating nut located about one meter 3 feet above finish grade. Gate valves for use with indicator post shall conform to UL 262. Indicator posts shall conform to UL 789. Provide each indicator post with one coat of primer and two coats of red enamel paint.

] [2.3.4 Valve Boxes

Except where indicator posts are provided, for each buried valve, provide cast-iron, ductile-iron, or plastic valve box of a suitable size. Plastic boxes shall be constructed of acrylonitrile-butadiene-styrene (ABS) or inorganic fiber-reinforced black polyolefin. Provide cast-iron, ductile-iron, or plastic cover for valve box with the word "WATER" cast on the cover. The minimum box shaft diameter shall be 133 mm 5.25 inches. Coat cast-iron and ductile-iron boxes with bituminous paint applied to a minimum dry-film thickness of 0.254 mm 10 mils.

] [2.3.5 Buried Utility Warning and Identification Tape

Provide detectable aluminum foil plastic backed tape or detectable magnetic

plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 80 mm 3 inches minimum width, color coded for the utility involved with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "CAUTION BURIED WATER PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

]2.4 PIPE SLEEVES

Provide where piping passes entirely through walls, floors, and roofs. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs. Provide 25 mm one inch minimum clearance between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with UL listed fill, void, or cavity material.

- a. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.
- b. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gage galvanized steel sheet.

2.5 ESCUTCHEON PLATES

Provide split hinge metal plates for piping entering walls, floors, and ceilings in exposed spaces. Provide polished stainless steel plates or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on metal plates in unfinished spaces.

PART 3 EXECUTION

3.1 INSTALLATION

Installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with NFPA 13, except as modified herein. Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings. Keep the interior and ends of new piping and existing piping affected by Contractor's operations thoroughly cleaned of water and foreign matter. Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter. Inspect piping before placing into position. Provide Teflon pipe thread paste on male threads.

3.1.1 Electrical Work

Provide electrical work associated with this section under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, except for control [and fire alarm] wiring. [Provide fire alarm system under Section 28 31 74.00 20 INTERIOR FIRE ALARM

SYSTEM.] Provide control [and fire alarm] wiring[, including connections to fire alarm systems,] under this section in accordance with NFPA 70. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be used in dry locations not enclosed in concrete or where not subject to mechanical damage.

3.1.2 Disinfection

Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 milligram per kilogram (mg/kg) parts per million (ppm) of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 mg/kg ppm, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit results prior to the new water piping being placed into service. Disinfection of systems supplied by nonpotable water is not required.

3.1.3 Connections to Existing Water Supply Systems

Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around the main piping; bolt valve to the branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Contracting Officer in writing at least [_____] [15] days prior to connection date; receive approval before any service is interrupted. Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labor as required. [Furnish] [Government will furnish only] the labor and the tapping or drilling machine for making the actual connections to existing systems.

3.1.4 Buried Piping System

Bury tape with the printed side up at a depth of 305 mm 12 inches below the top surface of earth or the top surface of the subgrade under pavements.

3.2 FIELD QUALITY CONTROL

Perform test to determine compliance with the specified requirements in the presence of the Contracting Officer. Test, inspect, and approve piping before covering or concealing.

3.2.1 Preliminary Tests

Hydrostatically test each system at 1379 kPa (gage) 200 psig for a 2 hour period with no leakage or reduction in pressure. Flush piping with potable water in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13.

3.2.2 Formal Tests and Inspections

Do not submit a request for formal test and inspection until the

preliminary test and corrections are completed and approved. Submit a written request for formal inspection at least [_____] [15] days prior to inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. At this inspection, repeat any or all of the required tests as directed. Correct defects in work provided by the Contractor, and make additional tests until the systems comply with contract requirements. Furnish appliances, equipment, [water,] electricity, instruments, connecting devices, and personnel for the tests. [The Government will furnish water for the tests.] The [_____] Division, Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests and approve systems before they are accepted.

3.3 FIELD PAINTING

Field painting of fire extinguishing sprinkler system shall be specified in Section 09 90 00 PAINTS AND COATINGS.

3.4 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurement, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements shown are as follows:

<u>Products</u>	<u>Inch-Pound</u>	<u>Metric</u>
Sprinkler Heads Orifice	0.50 inch	12.7 mm
	0.53 inch	13.5 mm
Pump Capacity	one gpm	63 mL/s
Identification Tape Width	3 inches	80 mm

-- End of Section --