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USACE / NAVFAC / AFCEC / NASA **UFGS-21 21 00 (April 2006)**

Preparing Activity: NAVFAC **Replacing without change UFGS-13931 (September 1999)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2021
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SECTION 21 21 00

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04/06

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SECTION 21 21 00

FIRE EXTINGUISHING SPRINKLER SYSTEMS (RESIDENTIAL)
04/06

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NOTE: This guide specification covers the requirements for automatic wet pipe fire extinguishing sprinkler systems for one- and two-family dwellings, for multi-family housing, and for residential occupancies of four stories and less.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

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

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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NOTE: System requirements shall conform to UFC 3-600-01, "Fire Protection Engineering for Facilities"; NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes"; NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies Up To and Including Four Stories in Height"; and NFPA 13, "Installation of Sprinkler Systems" where guidance is not provided in NFPA 13D or NFPA 13R. Use NFPA 13D for single family dwellings, duplexes, and manufactured homes. Use NFPA 13R for townhouses, apartment buildings, and bachelor quarters type buildings of four stories and less.

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NOTE A: The following information shall be shown on project drawings:

1. Do not show the detailed sprinkler system new layout on contract drawings.

2. 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, electric bell, riser check valves, and associated electrical connections.

3. Location where each sprinkler system begins including connection to water distribution system piping.

4. Location of sprinkler system control valves, post indicator valves, wall indicator valves, backflow preventers, drain valves, and test connections.

5. Area of sprinkler system coverage when system is protecting partial areas.

6. Details of anchoring piping, including pipe clamps and tie rods, or mechanical retainer glands.

7. 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 Reference Identifier (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.

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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 MECHANICAL ENGINEERS (ASME)

ASME A17.1/CSA B44	(2019) Safety Code for Elevators and Escalators

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651	(2014) Standard for Disinfecting Water Mains

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

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

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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2019; Errata 19-1; Errata 19-2; TIA 19-1; TIA 19-2; TIA 19-3; TIA 19-4; Errata 19-3; Errata 20-4; TIA 19-5; TIA 19-6) Standard for the Installation of Sprinkler Systems
NFPA 13D	(2016) Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
NFPA 13R	(2013) Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 24	(2019; TIA 19-1) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 72	(2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code

UNDERWRITERS LABORATORIES (UL)

UL 262	(2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service
UL 789	(2004; Reprint May 2017) UL Standard for Safety Indicator Posts for Fire-Protection

Service

UL Fire Prot Dir (2012) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Design and provide [new and modify existing] automatic wet pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout [_____], except sprinklers may be omitted from areas as allowed by [NFPA 13D] [NFPA 13R].

1.3 SPRINKLER SYSTEM DESIGN

****
NOTE: Use NFPA 13D for single family dwellings, duplexes, and manufactured homes. Use NFPA 13R for townhouses, apartment buildings, and bachelor quarters type buildings of four stories and less.
****

Design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of [NFPA 13D] [NFPA 13R] [manufacturer's recommendations] by hydraulic calculations, except as modified herein. 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 APP GUIDE approved for use in wet pipe sprinkler systems.

1.3.1 Location of Sprinkler Heads

Location of heads in relation to the ceiling and the spacing of sprinkler heads shall comply with that permitted by [NFPA 13D] [NFPA 13R] [NFPA 13] [manufacturer's recommendations].

1.3.2 Design Discharge

Discharge shall be at least 1.14 L/s 18 gpm from any single sprinkler and not less than 0.82 L/s 13 gpm per sprinkler for the number of sprinklers required. [Design discharge area shall be in accordance with the listed sprinkler criteria.]

1.3.3 Number of Design Sprinklers

The number of design sprinklers shall include sprinklers within a compartment to a maximum of [two for an NFPA 13D system] [four for an NFPA 13R system].

1.3.4 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 150 for plastic piping, except that friction loss may be based upon available manufacturer's data for specially listed piping products.

1.3.5 Water Supply

Base hydraulic calculations on a static pressure of [_____] kPa (gage) psig with [_____] L/s gpm available at a residual pressure of [_____] kPa (gage) psig at the [_____].

1.3.6 Outside Hose Allowances

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

1.3.7 Detail Working Plan Drawings

Prepare 60 by 900 mm 24 by 36 inch detail working plan drawings of sprinkler heads and piping system layout in accordance with [NFPA 13D] [NFPA 13R]. 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 working plan drawings signed by a Registered Fire Protection Engineer.]

1.3.8 As-Built Drawings

After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Submit 600 by 900 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."

1.4 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters 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.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

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" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The [[_____] Division, Naval Facilities Engineering Command] [Engineering Field Activity, [_____]], Fire Protection Engineer, will review and approve 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] [Engineering Field Activity, [_____]], 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] [Engineering Field Activity, [_____]], Fire Protection Engineer one set of approved submittals and working plan drawings immediately after approval and at least 15 working days prior to the inspection date.]

SD-02 Shop Drawings

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

Electrical wiring diagrams; G[, [_____]]

SD-03 Product Data

Piping; G[, [_____]]

Alarm valves; G[, [_____]]

Valves, including gate, check, and globe; G[, [_____]]

Water motor alarms; G[, [_____]]

Sprinkler heads; G[, [_____]]

Pipe hangers and supports; G[, [_____]]

[Pressure] [or] [flow] switch; G[, [_____]]

Fire department connections; G[, [_____]]

Alarm bells; G[, [_____]]

Mechanical couplings; G[, [_____]]

Backflow prevention assemblies; G[, [_____]]

Valve tamper switch; G[, [_____]]

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

SD-05 Design Data

Sprinkler system design; 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[, [_____]]

SD-07 Certificates

Qualifications of installer; G[, [_____]]

SD-10 Operation and Maintenance Data

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

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

SD-11 Closeout Submittals

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

1.5 QUALITY ASSURANCE

1.5.1 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.

****

NOTE: For projects administered by the Pacific Division, Naval Facilities Engineering Command, include the following optional paragraph requiring the minimum qualification of a NICET Level-III

technician for preparation of fire protection system drawings.
****

Qualifications of System Technician: Installation drawings, shop drawings, and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of work 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 the automatic sprinkler system program. The Contractor shall submit data for approval showing the name and certification of involved individuals with such qualifications at or prior to submittal of drawings.

PART 2 PRODUCTS

2.1 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 shall not be permitted. Perform welding in the shop; field welding shall not be permitted. Conceal piping in areas with [suspended ceiling] [and] [_____].

2.1.1 Sprinkler Piping

[NFPA 13D] [NFPA 13R], except as modified herein. [Steel piping shall be Schedule 40 for sizes less than 65 mm 2.5 inches, and Schedule [10] [or] [40] for sizes 65 to 200 mm 2.5 to 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 shall 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 APP GUIDEapproved 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 40 shall not be threaded. [Side outlet tees using rubber gasketed fittings shall not be permitted.] [Sprinkler piping shall be metal.] [Avoid running sprinkler piping in attics and other areas subject to freezing.]

2.1.2 Sprinkler Heads

Release element of each head shall be of the [ordinary] [_____] 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 UL listed [residential] [quick response] sprinkler heads in accordance with [NFPA 13D] [NFPA 13R]. No o-rings will be permitted in sprinkler heads.

2.1.3 Cabinet

****
NOTE: In townhouses, it is not desirable to have spare cabinets with sprinkler heads accessible to

residents. Spare heads should be turned over to the activity housing officer or public works department.
****

Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to the system riser. The number and types of extra sprinkler heads shall be as specified in [NFPA 13D] [NFPA 13R].

2.1.4 Alarm Valves

****
NOTE: Alarm valves are not required for NFPA 13D systems. Alarm valves are required for NFPA 13R systems installed in apartment buildings and bachelor quarters type buildings, but are not required for NFPA 13R systems installed in townhouses.
****

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

2.1.5 Water Motor Alarms

****
NOTE: Water motor alarms are not required for NFPA 13D systems. Water motor alarms are required for NFPA 13R systems installed in apartment buildings and bachelor quarters type buildings, but are not required for NFPA 13R systems installed in townhouses.
****

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.

2.1.6 [Pressure] [or] [Flow] Switch

****
NOTE: Pressure/flow switches are not required when using the NFPA 13D combined multipurpose domestic/fire system. Provide a pressure switch when an alarm valve is used, otherwise provide a flow switch. Do not install a shutoff valve in the piping between the alarm valve and the pressure switch.
****

Provide switch with circuit opener or closer for automatic transmittal of an alarm over the facility fire alarm system.[Connect into the building fire alarm system.][Connection of switch shall be under Section [28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE] [28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE] [28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE] [28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE].][Alarm actuating device shall have

mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.]

2.1.7 Alarm Bells

****
NOTE: Alarm bells are required for NFPA 13D systems. Alarm bells are required for NFPA 13R systems installed in townhouses, but are not required for NFPA 13R systems installed in apartment buildings and bachelor quarters type buildings.
****

Provide surface mounted [100], [150] or [200] mm [4], [6] or [8] inch diameter [weatherproof] vibrating bell having a sound output rating of at least 88 decibels at 3 meters 10 feet. Mount on [interior] [exterior] surface of an [interior] [exterior] wall [on end of dwelling unit facing the street] [as directed]. Mounting height shall be at least [3] [_____] meters [10] [_____] feet above finished grade. Provide for local alarm only.

2.1.8 Valve Tamper Switch

****
NOTE: Valve supervisory switches are required for NFPA 13R systems, not NFPA 13D systems.
****

Provide valve tamper switch(es) to monitor the open position of valve(s) controlling water supply to the sprinkler system. Switch contacts shall transfer from the normal position to the off-normal position during the first two revolutions of the hand wheel or when the stem of the valve has moved not more than one-fifth of the distance from its normal position. Switch shall be tamper resistant. Removal of the cover shall cause switch to operate into the off-normal position. Connection to the fire alarm system shall be in accordance with [Section 28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE] [Section 28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE] [Section 28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE] [Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE] [NFPA 72] [NFPA 70].

2.1.9 Pipe Hangers and Supports

Provide in accordance with [NFPA 13D] [NFPA 13R]. [Attach to steel joists with 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.]

2.1.10 Valves

****
NOTE: Include last bracket for NFPA 13D systems. Include last bracket for NFPA 13R system installed in townhouses, but delete for systems that have alarm check valves.
****

[NFPA 13D] [NFPA 13R]. Provide [indicating valves] [indicating valves with tamper switches] of types listed for fire service. Gate valves shall open by counterclockwise rotation. [Check valves shall be flanged clear opening swing-check type with flanged inspection and access cover plate for sizes 65 mm 2.5 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/CSA B44.] [Provide a single control valve arranged to shut off the domestic water and the sprinkler system and a separate shutoff valve for domestic water only.]

2.1.11 Identification Signs

[NFPA 13D] [NFPA 13R]. 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.]

2.1.12 Backflow Prevention Assemblies

Provide [reduced pressure principle,] [double check,] [dual check] [detector check] type backflow prevention assemblies which are approved by and have a current "Certificate of Approval" from the FCCCHR List. Listing of the particular make, model and design, and size in the FCCCHR List shall be acceptable as the required proof.

2.1.13 Inspector's Test Connection

Provide test connections approximately 1.83 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 location where the discharge shall be readily visible and where water may be discharged without property damage. Provide discharge orifice of same size as corresponding sprinkler orifice.

2.1.14 Main Drains

Provide separate drain piping to discharge at safe points outside each building or to sight glasses attached to drains of adequate size to readily receive the full flow from each drain under maximum pressure. The discharge shall be readily visible and shall flow to a location that will not cause property damage. Provide auxiliary drains as required by [NFPA 13D] [NFPA 13R].

2.1.15 Fire Department Connections

****
NOTE: Delete this paragraph for NFPA 13D systems. Use this paragraph for NFPA 13R systems with alarm check valves.
****

Provide 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, [plastic breakaway caps,] and identifying fire department connection escutcheon plate.

2.2 BURIED WATER PIPING SYSTEMS

2.2.1 Pipe and Fittings

[NFPA 13D] [NFPA 13R]. Provide polyvinyl chloride (PVC) piping, chlorinated polyvinyl chloride (CPVC) piping, or Type K copper tubing. Provide a dielectric union between copper piping and any metal piping. Minimum pipe size shall be [_____] mm 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 Short Form Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.]

2.2.2 Valves

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

2.2.3 Post Indicator Valves

****

NOTE: Post indicator valves are only required for NFPA 13R systems.

****

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.

2.2.4 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 134 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.

2.2.5 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, 76 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.

2.3 PIPE SLEEVES

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. 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.

2.3.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or Schedule 40 PVC plastic pipe 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. Provide an annular clearance around the sprinkler riser where it passes through the concrete slab in accordance with NFPA 13.

2.3.2 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.4 ESCUTCHEON PLATES

Provide one piece or split hinge metal plates for piping entering floors, walls, 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 13D[,] [and] NFPA 13R, [and 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 based pipe thread sealant or Teflon tape on male pipe threads only.

3.1.1 Electrical Work

Provide electrical work associated with this section under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, except for fire alarm wiring. Provide fire alarm system under [Section 28 31 60 INTERIOR FIRE ALARM SYSTEM, NON-ADDRESSABLE] [Section 28 31 66 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, NON-ADDRESSABLE] [Section 28 31 70 INTERIOR FIRE ALARM SYSTEM, ADDRESSABLE] [Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE]. 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 on the supply

side of the backflow preventer affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 milligram per kilogram 50 parts per million 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 milligram per kilogram 0.2 to 0.5 parts per million, 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 Wet Tap Connections to Existing Underground 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, without interruption of service. Notify the Contracting Officer in writing at least [_____] [15] working 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] [The Government will furnish only] the labor and the tapping or drilling machine for making the actual connections to existing systems. Underground mains and lead-in connections to system risers shall be flushed before a connection is made to the sprinkler piping.

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 PAINTING

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NOTE: Use these paragraphs for steel sprinkler piping systems.

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Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, steel piping, conduit, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat of pretreatment primer applied to a minimum dry film thickness of 0.008 mm 0.3 mil, and one coat of zinc molybdate primer applied to a minimum dry film thickness of 0.025 mm 1.0 mil. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

3.2.1 Piping in Unfinished Areas

Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 0.025 mm 1.0 mil in attic spaces, spaces

above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material. [In lieu of red enamel finish coat, provide piping with 51 mm 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 6 meters 20 foot intervals.]

3.2.2 Piping in Finished Areas

Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 0.025 mm 1.0 mil. Provide piping with 51 mm 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 6 meters 20 foot intervals throughout the piping systems.

3.3 FIELD QUALITY CONTROL

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

3.3.1 Preliminary Tests

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NOTE: Hydrostatic testing at 1379 kPa 200 psi is not required for NFPA 13D systems unless pumper connections are provided.
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[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 13D] [NFPA 13R]. 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 13D] [NFPA 13R].

3.3.2 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] working 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] [Engineering Field Activity [_____]], Fire Protection Engineer, will witness formal tests and approve systems before systems are accepted.

-- End of Section --