
USACE / NAVFAC / AFCEC / NASA UFGS-21 13 19.00 20 (November 2009)

Preparing Activity: NAVFAC Superseding
UFGS-21 13 19.00 20 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2015

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DIVISION 21 - FIRE SUPPRESSION

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11/09

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[DELUGE] [PREACTION] FIRE SPRINKLER SYSTEMS 11/09

NOTE: This guide specification covers the requirements for automatic deluge and preaction fire extinguishing sprinkler systems.

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 items(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).

NOTE: Use deluge systems for high hazard occupancies and as required by UFC 3-600-01 "Fire Protection Engineering for Facilities" or applicable NFPA standards. Use preaction systems in lieu of wet pipe systems where extraordinary precautions against accidental water discharge is warranted. For NAVFAC users, system requirements shall conform to UFC 3-600-01 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, deluge or preaction valve, water motor alarm, fire department inlet connection, control panel, air compressor, 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.
7. Do not show detector placement, conduit runs, or number of conductors.

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 WATER WORKS ASSOCIATION (AWWA)

AWWA C651 (2014) Standard for Disinfecting Water Mains

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44 (2013) Safety Code for Elevators and Escalators

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

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

MSS SP-58 (1993; Reaffirmed 2010) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13 (2013; TIA 10-1; TIA 11-2; ERTA 2014; TIA 14-3) Standard for the Installation of Sprinkler Systems

NFPA 15 (2012) Standard for Water Spray Fixed Systems for Fire Protection

NFPA 24 (2013) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NFPA 409 (2011; Errata 11-1) Standard on Aircraft Hangars

NFPA 70 (2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

NFPA 72 (2013) National Fire Alarm and Signaling Code

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25 (1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned

Steel, Type I and Type II

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-2962 (Rev A; Notice 2) Enamel, Alkyd, Gloss,
Low VOC Content

UNDERWRITERS LABORATORIES (UL)

UL 262 (2004; Reprint Oct 2011) Gate Valves for
Fire-Protection Service

UL 789 (2004; Reprint Feb 2013) Standard for
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 [deluge] [preaction] fire extinguishing sprinkler systems for complete fire protection coverage throughout [_____].

1.3 SPRINKLER SYSTEM DESIGN

NOTE: For areas smaller than 93 sq meters 1,000 sq ft, use hydraulic calculations for deluge systems, and use pipe schedules for preaction systems. For areas larger than 93 sq meters 1,000 sq ft, use hydraulic calculations complying with MIL-HDBK-1008 for deluge systems and for preaction systems. For 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." Earthquake protection shall be required for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2.

Design automatic [deluge] [preaction] fire extinguishing sprinkler systems in accordance with the required and advisory provisions of NFPA 13 [NFPA 15], except as modified herein, by hydraulic calculations using the area design method for uniform distribution of water over the design area. 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. Devices and equipment for fire protection service shall be UL Fire Prot Dir listed or FM APP GUIDE approved for use in [deluge] [preaction] sprinkler systems. [Design systems for earthquake protection.]

1.3.1 Location of Sprinkler Heads

Spacing of sprinklers and position and orientation of sprinklers in relation to the ceiling, walls, and obstructions shall conform to NFPA 13 for [light] [ordinary] [_____]hazard occupancy [for the entire building] [for [_____]areas]. Uniformly space sprinklers on the branch piping.

1.3.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinkler heads will cover. Discharge from individual heads shall be not less than 100 percent of the specified density.

1.3.3 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.

**NOTE: The designer shall use the criteria provided
within MIL-HDBK-1008 for guidance with the sprinkler
design area and outside hose allowance requirements.**

1.3.4 Sprinkler Design Area

[Area shall be the hydraulically most remote [_____] sq meter ft area as defined in NFPA 13.] [Area shall be [as indicated.] [based on the [_____] meter foot radius rule and shall conform to NFPA 409 for aircraft hangars.] [_____.]] [For deluge systems, design area shall be the entire area protected by the system.]

1.3.5 Outside Hose Allowances

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

1.3.6 Friction Losses

Calculate losses in piping in accordance with the Hazen-Williams formula with 'C' value of [120 (deluge)] [100 (preaction)] for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping. Velocity in sprinkler piping shall be limited to a maximum of 6 meters per second 20 feet per second.

1.3.7 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.]

1.3.8 Detail Drawing

Prepare A1 841 by 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 location and orientation of sprinkler heads in relation to obstructions. Show point to point electrical wiring diagrams. [Submit drawings signed by a registered fire protection engineer.]

1.3.9 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 by 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."

1.4 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.

The Guide Specification technical editors have designated 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 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.

An "S" following a submittal item indicates that the submittal is required for the Sustainability Notebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

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.] Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

[The [_____] Division][EFA [_____]], 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 for Navy projects.

[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[, [_____]]

Electrical wiring diagrams; G[, [_____]]

SD-03 Product Data

Piping; G[, [_____]]

[Deluge] [Preaction] valves; G[, [_____]]

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

[Water motor alarms; G[, [_____]]]

Sprinkler heads; G[, [_____]]

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

Pressure switch; G[, [_____]]

Fire department connections; G[, [_____]]

Air compressor; G[, [_____]]

Detection devices; G[, [_____]]

Storage batteries; G[, [_____]]

Air maintenance device; G[, [_____]]

Control panel; G[, [_____]]

Battery charger; G[, [_____]]

Mechanical couplings; G[, [_____]]

Backflow Preventer; G[, [_____]]

Manual Remote Release Stations; G[, [_____]]

Alarms; G[, [_____]]

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

SD-05 Design Data

Sprinkler system design; G[, [_____]]

Secondary Power Supply; G[, [_____]]

Submit computer program generated hydraulic calculations to substantiate compliance with hydraulic design requirements. Submit the name of the 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

[Deluge] [Preaction] valves, Data Package 3; G[, [_____]]

Air compressor, Data Package 3; G[, [_____]]

Control panel, Data Package 3; G[, [_____]]

Backflow preventer, 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 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.

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

2.1.1 Sprinkler Piping

NFPA 13, except as modified herein. [Steel piping shall be Schedule [10] [or] [40] for pipe sizes less than 200 mm 8 inches, and may be Schedule [10] [30] [or] [40] for sizes 65 mm 2.5 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 APP GUIDE approved for use in dry pipe sprinkler systems. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer. [Side outlet tees using rubber gasketed fittings shall not be permitted.] Steel piping with wall thickness less than Schedule 30 shall not be threaded. Steel piping shall be [galvanized][black steel]. [Sprinkler pipe and fittings shall be metal.]

2.1.2 Sprinkler Heads

Provide nominal 12.7 mm 0.50 inch [or 13.5 mm 0.53 inch] orifice standard [_____]sprinkler heads. No o-rings will be permitted in sprinkler heads.[For preaction systems, the release element of each head shall be of the [ordinary] [_____] temperature rating or higher as suitable for the specific application.] [For deluge systems, provide open heads.] 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. Automatic sprinklers installed in the pendent position shall be of the dry-pendent

type [except that standard pendent sprinklers may be installed on return bends when both the sprinklers and the return bends are located in a heated area].

2.1.1.3 Cabinet for System

Provide a minimum [four] [_____] of each type of sprinkler head[, including a representative sample of dry pendent type sprinklers] and sprinkler head wrench adjacent to each deluge or preaction valve. The number and types of extra sprinkler heads shall be as specified in NFPA 13.

2.1.1.4 [Deluge] [Preaction] Valves

Valves shall be operated by a detection system listed for releasing service and independent of building fire alarm system. [[Deluge] [Preaction] valve clappers shall incorporate a [mechanical] latching mechanism that will not be affected by pressure changes in the water system.] If 150 mm 6 inch valves are used in 200 mm 8 inch risers, provide smoothly tapered connections. In addition to automatic operation, arrange each valve for manual release at the valve. Provide pressure gages and other appurtenances at the [deluge] [preaction] valves. Provide a test detection device for each actuation circuit adjacent to each valve which the device controls as required by NFPA 13. [Provide remote manual releases where indicated.] [_____].

2.1.1.5 [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.

]2.1.1.6 Pressure 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, CLOSED CIRCUIT TELEGRAPHIC TYPE] [28 31 74.00 20 INTERIOR FIRE DETECTION AND ALARM SYSTEM]. [Alarm actuating device shall have mechanical diaphragm controlled retard device adjustable from 0 to 60 seconds and shall instantly recycle.] Do not install a shutoff valve in the piping between the [preaction][deluge] valve and any pressure switch.

2.1.1.7 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.

2.1.1.8 Valves

NFPA 13. Provide valves of types approved for fire service. Valves shall open by counterclockwise rotation. [Provide [a rising stem] [an OS&Y] [a wall indicator] valve beneath each deluge or preaction valve.] [Check valves shall be [flanged] clear opening swing-check type with flanged

inspection and access cover plate for sizes [100 mm 50 inches][200 mm 8 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.]

2.1.8.1 Valve Supervision

Provide supervision of each control valve against closure and tampering in accordance with NFPA 13. [Provide switch with SPDT (Form C) dry contacts for the automatic transmittal of a supervisory signal over the facility fire alarm system; minimum switch contact rating shall be 2.5 amperes at 24 VDC. A supervisory signal shall be initiated during the first two revolutions of the hand wheel, or during the first 1/5th of travel distance of the valve stem, from full open. Connection of the switch shall be under Section [28 31 74.00 20 INTERIOR FIRE DETECTION AND ALARM SYSTEM] [28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM]]. [Provide breakaway key operated locks and steel chains to secure all control valves against unauthorized closure or tampering.]

2.1.9 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."

2.1.10 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.]

2.1.11 Test Connections

2.1.11.1 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 [0.61 meter 2 feet] [_____] above finished grade.]

2.1.11.2 [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 16 L/s 250 gpm of system demand or fraction thereof. Provide a permanent sign in accordance with paragraph entitled "Identification Signs" which reads, "Test Valve."

2.1.12 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 [0.61 meters 2 feet] [_____] 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.]

2.1.13 Fire Department Connections

Provide [[100] [_____] mm single [Storz] [_____] type] [4] [_____] inch 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.

2.1.14 Tank Mounted Air Compressor

**NOTE: Air pressure is required for supervision of
pneumatic tubing or piping for pneumatically-
operated deluge or preaction sprinkler systems and
for sprinkler piping of preaction systems.**

Provide an approved, automatic type, electric motor-driven air compressor including pressure switch, air piping, and [_____] [38 liter] [10 gallon] minimum capacity tank. Compressor shall have a minimum capacity capable of charging the complete sprinkler system to normal system air pressure within 30 minutes and within 15 minutes for the pneumatic detection system. Provide an approved automatic air maintenance device for each system.

2.2 BURIED WATER PIPING SYSTEMS

**NOTE: Minimum depth of cover shall comply with NFPA
24.**

2.2.1 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.

2.2.2 Valves

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

2.2.3 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.

2.2.4 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 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.

2.2.5 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, 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.

2.3 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.

2.4 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.

2.5 DETECTION DEVICES

Provide [electric] [heat detectors] [and] [smoke detectors]. Connecting piping, tubing, devices, and wiring shall be supervised so that an audible and visual trouble signal is operated when there is a fault in the system. Provide tubing and wiring in protective [material] [metal] conduit or tubing. Detectors located in areas subject to moisture or exterior atmospheric conditions shall be types approved for such locations. Removal of any detector from the system shall result in the actuation of a trouble signal. Furnish not less than two spare detectors of each type for each system.

2.5.1 Spot Heat Detectors

NOTE: Provide rate compensated type for buildings such as aircraft hangars where opening of doors in cold weather could actuate the system. Do not use hydraulic actuation system in hangar bays and unheated areas in regions subject to freezing.

Provide detectors for [surface] [flush] outlet box mounting. Support detectors independently of conduit, tubing, or wiring connections. Detectors shall be completely metal enclosed and shall be [combination fixed temperature and rate-of-rise] [fixed temperature and rate compensated] [infrared] [ultraviolet] [_____] type. Contacts shall be self-resetting after [response to rate-of-rise] actuation. [Operation under fixed temperature actuation shall result in an indication which may be noted by external visual inspection of the detector, or the detector may be the self-resetting type.] Space detectors in accordance with NFPA 72, except provide at least two detectors in areas exceeding 55 sq meters 600 sq feet. Provide fixed temperature type detectors in areas subject to abnormal temperature changes, such as showers and boiler rooms. Reduce heat detector spacing in areas with ceiling heights greater than 3 meters 10 feet in accordance with NFPA 72. For ceiling heights greater than 9 meters 30 feet, space detectors based on an assumed height of 9 meters 30 feet. [Furnish a portable electric device suitable for testing the detectors.]

2.5.2 Smoke Detectors

Provide for detection of abnormal smoke densities by the [ionization] [or] [photoelectric] principle. Provide control and power panels required for operation of the detector either as individual detectors or detectors integral with the main control panel. Provide detectors and associated panels which are compatible with main control panel being provided and suitable for use in a supervised circuit. Malfunction of the electrical circuitry to the detector or detector control or power panels shall actuate the system trouble devices. Each detector shall contain a visible indicator lamp that shall indicate when the detector is activated. Each detector shall be the plug-in type with screw terminals in the detector base for wiring connections. Detector spacing and location shall be in accordance with manufacturer's recommendations and the requirements of NFPA 72; however, spacing shall not exceed 9 by 9 meters 30 by 30 feet per detector, and 9 linear meter 30 lineal feet per detector along corridors. Do not locate detectors within 1.50 meters 5 feet of air supply diffusers and registers, or within<MET 12 inches of lighting fixtures. [Provide remote indicator lamp for each detector located above suspended ceilings,

beneath raised floors, or otherwise concealed from view.] Mount detectors located beneath raised floors face downward, with the base within 50 mm 2 inches of the underside of the raised floor. Where the space under the raised floor is less than 305 mm 12 inches in height, mount detectors with the base either horizontal or vertical, with the detection chamber located in the upper half of the underfloor space. Do not mount detectors facing upward.

- a. Ionization Detectors: Provide multiple chamber type which are responsive to both invisible and visible particles of combustion. Detector operation shall not be affected by changes in relative humidity.
- b. Photoelectric Detectors: Provide detectors which operate on a multiple cell concept using a light-emitting diode (LED) light source. Failure of the LED shall not cause an alarm condition but shall operate the detector indicating lamp.

2.5.3 Control Panel

NOTE: Use for electrically operated systems.

Provide a [modular type] control panel for electrically operated detection and extinguishing systems for each [deluge] [preaction] valve; install in a surface-mounted steel cabinet with hinged doors [and cylinder lock]. Control panels shall be a neat, compact, factory-wired assembly containing components and equipment necessary to perform specified operating and supervisory functions of the system. Provide a control panel with an isolation switch that shall, when activated, allow testing of the system without activating the [preaction] [deluge] valve. House batteries in a lockable steel cabinet. Finish interior and exterior of cabinet with enamel paint; attach prominent rigid plastic or metal identification plates. Provide trouble lights on cabinet door, and provide trouble alarm above cabinet top. Provide 120 volts ac service, transformed through a two-winding isolation type transformer and rectified to low-voltage dc for operation of all system actuating, signal sounding, trouble signal, and fire alarm tripping circuits. [Control panel shall be UL Fire Prot Dir listed or FM APP GUIDE approved as an extinguishing system releasing panel and shall be separate from the building's fire alarm control panel.]

2.5.4 Secondary Power Supply

Provide nickel cadmium, lead calcium, or sealed lead acid rechargeable storage batteries and battery charger. Dry cell batteries will not be permitted.

- a. Storage Batteries: Provide rechargeable lead calcium or sealed lead acid type with sufficient ampere-hour rating to operate the system under supervisory [and trouble] conditions [, including audible trouble signal devices] for [60] [_____] hours and audible [and visual] signal devices under alarm conditions for an additional [10] [_____] minutes and as required per the equipment listing. Separate cells to prevent contact between terminals of adjacent cells and between battery terminals and other metal parts.
- b. Battery Charger: Provide solid state automatic two rate type, capable of recharging completely discharged batteries to fully charged

condition in 24 hours or less. Locate charger within the control panel or within the battery cabinet.

2.5.5 Wiring

Provide solid copper [_____] wiring in accordance with NFPA 70. Obtain ac primary power for control panel, battery charger[, and air compressor] from the line side of the incoming building power source ahead of all building services [at the location indicated]. Provide independent, properly fused safety switches, with provisions for locking the covers and operating handles in the POWER ON position for such connections; locate switches adjacent to main distribution panel. Paint the switch boxes red and identify by a permanent lettered designation. Wiring and devices exposed to the water deluge shall be weatherproof type. Wiring and devices in hazardous atmosphere shall be explosion-proof type. [Wire for 120-volt circuits shall be No. 12 AWG minimum.] Wire for low-voltage dc circuits shall be No. [14] [16] AWG minimum. Provide wiring in rigid metal conduit, intermediate metal conduit, or electrical metallic tubing. Identify circuit conductors within each enclosure where a tap, splice, or termination is made. Identify conductor by plastic coated, self-sticking printed markers or by heat-shrink type sleeves. Attach and secure markers to prevent accidental detachment. Properly identify control circuit terminations.

2.5.6 Supervision

[Preaction sprinkler piping] [and] [pneumatic detection system] and [deluge] [preaction] valve electric releases shall be supervised. A break in the piping or tubing systems resulting in loss of pneumatic pressure shall activate trouble alarm. Provide a silencing switch which transfers trouble signals to an indicating lamp; arrange so that correction of the trouble condition will automatically transfer the trouble signal from the indicating lamp back to the trouble alarm until the switch is restored to normal position. Supervisory air pressure shall not exceed 10 psig.

2.5.7 Manual Remote Release Stations

Stations shall be [surface] [semiflush]-mounted. Stations shall not be subject to operation by jarring or vibration. Break-glass-front stations will not be permitted; however, a pull-lever, break-glass-rod type is acceptable. Station color shall be yellow [_____]. Display operating instructions on face of station in engraved or raised letters of contrasting color. Provide permanent metal or engraved plastic signs mounted above or beside each station, indicating which system that station controls. Lettering shall be a minimum of 38 mm 1.5 inches high. Station shall provide positive indication of operation. Restoration of station shall be accomplished only by means of a key or special tool.

2.6 ALARMS

2.6.1 [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] [indicated].

12.6.2 Local Alarm

NOTE: Delete if a building fire alarm system is provided.

Provide electric alarm [horn] [bell] to sound locally on operation of any detection system, regardless of water flow. The current for these alarms may be taken from the normal building service provided the connection is made ahead of the other services.

2.6.3 Fire Alarm

Provide equipment for the automatic transmittal of an alarm over the [facility] [building] fire alarm system and arrange to actuate by detection system [and by the flow of water in each sprinkler system]. [Provide supervision of detection and actuation circuits.]

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 DETECTION AND ALARM SYSTEM.] Provide control [and fire alarm] wiring[, including connections to fire alarm systems,] under this section in accordance with NFPA 72. 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 up to the [bottom flange of the [preaction] [deluge] valve] [backflow prevention device] 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 place 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. Photograph piping prior to burying, covering, or concealing.

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 345 kPa (gage) 50 psig above normal system static pressure or 1379 kPa (gage) 200 psig, whichever is greater, 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. The water shall be delivered to the system test connection in not more than 60 seconds, starting at the normal air pressure on the system and at the time of fully opened inspection 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] [EFA [_____]], Naval Facilities Engineering Command, Fire Protection Engineer, will witness formal tests and approve systems before they are accepted.

3.3 FIELD PAINTING

[Painting of sprinkler systems above suspended ceilings and in crawl spaces is not required.] Clean, prime, and paint new sprinkler system piping, valves, hangers, accessories, and miscellaneous metal work as specified [in Section 09 90 00 PAINTS AND COATINGS] [and] [herein]. Clean surfaces prior to painting. Immediately after cleaning, prime metal surfaces with SSPC Paint 25 or SSPC Paint 25 metal primer applied to a minimum dry film thickness of 0.04 mm 1.5 mils. Exercise care to avoid painting sprinkler heads and operating devices. Upon completion of painting, remove materials which were used to protect sprinkler heads and operating devices which have been inadvertently painted and provide new clean sprinkler heads and operating devices of the proper type. Finish primed surfaces as follows:

3.3.1 Systems in Finished Areas

Finished areas are defined as areas where walls or ceilings are painted or are constructed of a prefinished material. Paint primed surfaces with two coats of paint to match adjacent surfaces, except paint valves and operating accessories with two coats of gloss red enamel. [Provide piping with 50 mm 2 inch wide red enamel bands spaced at maximum 6 m 20 feet intervals throughout the piping system. Bands shall be gloss red enamel or self-adhering plastic.]

3.3.2 Systems in Unfinished Areas

Paint piping in valve rooms, [and] mechanical rooms, [and] [attics][and][crawl spaces] with CID A-A-2962 gloss red enamel applied to a minimum dry film thickness of 0.04 mm 1.5 mils.

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
Excess Pressure Pump Capacity	one gpm	63 mL/s
Air Compressor Tank Capacity	10 gallons	38 liters
Identification Tape Width	3 inches	80 mm
Trouble Alarm Bell or Horn Size	4 inches	100 mm

-- End of Section --