
USACE / NAVFAC / AFCEC / NASA UFGS-21 13 13.00 20 (April 2008)

Preparing Activity: NAVFAC Superseding
UFGS-21 13 00.00 20 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2018

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SECTION 21 13 13.00 20

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION 04/08

NOTE: This guide specification covers the requirements for wet pipe fire protection sprinkler systems.

Use of electronic communication is encouraged.

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. Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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

PART 1 GENERAL

NOTE: The Designer will edit this section for either a performance-designed system or a fully designed system as applicable.

This section is primarily intended for performance designed systems, i.e., systems where the size, layout, and support of branch lines and cross mains, and the layout of sprinklers will be designed by the Contractor.

The Designer will provide the following information in the contract documents for performance designed systems. This information will be in accordance with UFC 3-600-01. For NAVFAC projects, also include requirements of UFC 3-600-10N (DRAFT).

- (1) Show the layout and size of all piping and equipment from the point of connection to the water supply, to the sprinkler cross mains. The contract drawings must include a detailed sprinkler riser diagram.
- (2) Show location and size of service mains, interior feed mains, control valves, sprinkler risers, drain lines, sectional valves, and inspector's test valves and switches on the drawings.
- (3) Specify waterflow data including hydrant flow results, including the location where the hydrant flow test was conducted, the location and size of existing mains and new water supply lines that will serve the sprinkler system (including all supervisory valves), and the location and size of all risers.
- (4) Highlight or clearly indicate the area(s) to be protected by sprinklers on the drawings.
- (5) Specify waterflow requirements including the design density, design area, the hose stream demand (including location of the hose stream demand), the duration of supply, and sprinkler spacing and area of coverage in this section.
- (6) Show the location of the backflow preventer (including provisions for a drain and access for maintenance) where the potable water supply system is at risk of contamination by the sprinkler system on the drawings.
- (7) Show all provisions necessary for forward flow testing of the backflow preventer at system demand, as required by NFPA 13 on the drawings. Indicate location of all components and required items, including test ports, for pressure measurements both upstream and downstream of the backflow preventer, a drain to the building exterior, and appropriate, permanent means of disposing of the large quantity of water that will be involved in the initial test and subsequent annual tests.
- (8) Highlight all concealed spaces on the drawings that require sprinkler protection, such as spaces above suspended ceilings that are built of combustible material or that can contain combustible materials, such as storage, and communication cabling that is not fire-rated.
- (9) Provide details on the drawings of pipe restraints for underground piping. This includes details of pipe clamps, tie rods, mechanical retainer glands, and thrust blocks. Include size of wall or floor sleeve if required to meet earthquake requirements.

When connecting to an existing water distribution system, waterflow tests will be conducted in accordance with UFC 3-600-01 to determine available water supply for the sprinkler system. The Designer of Record shall either perform or witness the waterflow test. The waterflow test results (including date test is performed) should be included in the Project Development Brochure; however it is critical that the waterflow test results be included in the design documents no later than the concept submission. Note that the availability of the Designer to participate or witness the waterflow test will be necessary. The need for fire pumps or a water tank can in many instances have a significant impact on the amount programmed for design and construction of a facility.

A fully designed system will include the items listed above and all additional information required that is required by UFC 3-600-01 and NFPA 13 for a fully operational system. For NAVFAC Projects this list also includes UFC 3-600-10N (DRAFT).

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.

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.

ASTM INTERNATIONAL (ASTM)

ASTM D709	(2017) Standard Specification for Laminated Thermosetting Materials
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FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2016; TIA 16-1; TIA 16-2; TIA 16-3 2016; Errata 17-1; Errata 17-2) Standard for the Installation of Sprinkler Systems
NFPA 13R	(2013) Standard for the Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 1963	(2014) Standard for Fire Hose Connections
NFPA 24	(2016; ERTA 2016) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

UNDERWRITERS LABORATORIES (UL)

UL 262	(2004; Reprint Oct 2011) Gate Valves for Fire-Protection Service
UL 668	(2004; Reprint Jul 2016) UL Standard for Safety Hose 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

NOTE: Combined sprinkler and standpipe systems shall be provided when required by UFC 3-600-01. This specification section does not include requirements for combined sprinkler and standpipe systems. However; this specification in conjunction with the project drawings can be expanded to include such systems.

Design and provide [new and modify existing] automatic wet pipe fire extinguishing sprinkler systems for complete fire protection coverage throughout [the entire building][_____].

NOTE: Residential Occupancies: NFPA 13R is applicable for residential occupancies up to and including 4 stories in height. This standard should be referenced and followed only for such occupancies. NFPA 13R differs from NFPA 13 relative to type of sprinkler, design criteria, sprinkler coverage, etc. Care must be taken when using this specification for residential occupancies to assure

that the final project specification clearly indicates design requirements.

NOTE: Residential Occupancies: For residential occupancies other than multistory bachelor housing such as one and two family dwellings, the editor should consider using Specification Section 21 21 00 FIRE EXTINGUISHING SPRINKLER SYSTEMS (RESIDENTIAL) Do not use this specification section for sprinkler systems designed to the the requirements of NFPA 13D

NOTE: For all NAVFAC administered projects, any construction on Navy or Marine Corps facilities and any projects for the Air Force Air Combat Command (ACC); include requirement to assume a 12-psi loss for the backflow preventer. For all other projects use the second bracketed sentence.

1.3 SPRINKLER SYSTEM DESIGN

Except as modified herein, design automatic wet pipe fire extinguishing sprinkler systems in accordance with the required and advisory provisions of [NFPA 13][NFPA 13R] , including all recommendations and advisory portions, which shall be considered mandatory; this includes advisory provisions listed in the appendices of such standard(s), as though the word "shall" had been substituted for the word "should" wherever it appears. Design system by hydraulic calculations for uniform distribution of water over the design area. [Hydraulic calculations shall assume a [80 kPa][12 psi] [_____] pressure loss for the backflow preventer assembly.][Hydraulic calculations shall assume the pressure loss for the backflow preventer assembly is the same as the losses indicated on the manufacturer's data sheets.] Locate sprinklers in a consistent pattern with ceiling grid, lights, and air supply diffusers. Provide sprinklers and piping system layout. All 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. [Provide seismic protection for the sprinkler system. Design and install seismic protection in accordance with the requirements of NFPA 13 section titled "Protection of Piping Against Damage Where Subject to Earthquakes."]

1.3.1 Location of Sprinklers

Sprinklers in relation to the ceiling and the spacing of sprinklers shall not exceed [that permitted by NFPA 13 for [_____] [ordinary] [extra] hazard occupancy.][[_____] sq meter ft per sprinkler.][the hazards indicated on the contract drawings.] Uniformly space sprinklers on the branch piping. Sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces.

1.3.2 Water Distribution

Distribution shall be uniform throughout the area in which the sprinklers

will open. Discharge from individual sprinklers in hydraulically most remote area shall be between 100 percent and 120 percent of the specified density.

1.3.3 Density of Application of Water

NOTE: For all NAVFAC administered projects, any construction on Navy or Marine Corps facilities and any projects for the Air Force Air Combat Command (ACC) edit and utilize the following:

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.][as indicated on the contract drawings.]

NOTE: For Army Corps projects edit and utilize the following:

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 [4.1 L/min/sq meter 0.10 gpm per sq ft for Light Hazard Occupancies][6.1 L/min/sq meter 0.15 gpm per sq ft for Ordinary Hazard Group 1 Occupancies][8.2 L/min/sq meter 0.20 gpm per sq ft for Ordinary Hazard Group 2 Occupancies][12.2 L/min/sq meter 0.30 gpm per sq ft for Extra Hazard Group 1 Occupancies][16.3 L/min/sq meter 0.40 gpm per sq ft for Extra Hazard Group 2 Occupancies][_____] L/m per sq meter gpm per sq ft][as indicated on the contract drawings.]

1.3.4 Sprinkler Discharge Area

NOTE: The first paragraph is utilized when sprinkler system designer will need to make area adjustments required by NFPA 13. (i.e. increasing the design area 30 percent as required by NFPA 13 where ceiling slopes exceed 2 in 12 or decreasing the design area if permissible by NFPA 13 for the installation quick response sprinklers.) The second paragraph is used when the design area is reduced below the UFC requirements and/or the contractor will be given a design area which already includes the area increases/decreases.

[Permissible decreases and required increases from NFPA 13 shall be applied to an initial hydraulically most remote area of [_____] sq meter ft.]

[Area shall be the hydraulically most remote [_____] sq meter ft Area reductions and increases from NFPA 13 shall not be applied to this area.]

1.3.5 Outside Hose Allowances

NOTE: Designer shall insert into brackets the hose stream allowance for the most demanding hazard per UFC 3-600-01.

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

1.3.6 Water Supply

Base hydraulic calculations on [the water supply data shown on the fire protection contract drawings][the water supply data shown on the contract drawings][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 existing 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.]

NOTE: Applications requiring multiple densities/design areas must be referred to and shown on the drawings.

For sprinkler systems in residential occupancies, which are designed to NFPA 13R standards, paragraphs which address hydraulic design and sprinkler spacing must be edited according to NFPA 13R requirements.

NOTE: The design must include an adequate water supply to meet the sprinkler water demand. The designer must provide water flow test results and hydraulic calculations to ensure that the system demand will be met.

Design Calculations: The designer will provide detailed hydraulic calculations that clearly demonstrate that the water supply will meet the demand of the sprinkler system and hose streams. Calculations will be submitted with the concept design submission.

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 USACE 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 USACE 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" following a submittal item indicates that the submittal is required for the Sustainability eNotebook to fulfill federally mandated sustainable requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Locate the "S" submittal under the SD number that best describes the submittal item.

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.][information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.]

Partial submittals and submittals not fully complying with the requirements and recommended practices of NFPA 13 and this specification section shall be returned disapproved without review. This contract stipulation is non-negotiable.

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

SD-02 Shop Drawings

Shop Drawings; G[, [_____]]

Prepare A1 841 by 594 mm 24 by 36 inch detail working drawings of sprinklers and piping. Floor plans shall be drawn to a scale not less than 1:100 1/8" = 1'-0". 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. Provide [three][_____] copies of the Sprinkler System Shop Drawings, no later than [21][_____] days prior to the start of sprinkler system installation.

SD-03 Product Data

Pipe; G[, [_____]]
[Fittings ; G[, [_____]]]

[Alarm valves ; G[, [____]]]
 Valves, including gate, check, and globe ; G[, [____]]
 [Water motor alarms ; G[, [____]]]
 Sprinklers ; G[, [____]]
 Pipe hangers and supports ; G[, [____]]
 Sprinkler Alarm Switches; G[, [____]]
 Fire department connections ; G[, [____]]
 [Excess pressure pump ; G[, [____]]]
 Mechanical couplings ; G[, [____]]
 Backflow Prevention Assembly ; G[, [____]]
 Seismic Bracing ; G[, [____]]

Annotate descriptive data to show the specific model, type, and size of each item. Catalog cuts shall also indicate UL Listing/FM Approval and country of manufacture.

SD-05 Design Data

Hydraulic Calculations; G[, [____]]

NOTE: Include the bracketed item for Army Corps projects

Submit computer program generated hydraulic calculations to substantiate compliance with hydraulic design requirements. Calculations shall be performed by computer using software intended specifically for fire protection system design. [Calculations shall include isometric diagram indicating hydraulic nodes and pipe segments.] Submit name of software program used.

SD-06 Test Reports

request to schedule Preliminary Tests; G[, [____]]

Preliminary Test Report; G[, [____]]

Provide [Three][____] copies of the completed Preliminary Test Report, no later than [7][____] days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Engineer.

request to schedule Final Acceptance Test; G[, [____]]

Final Acceptance Test Report; G[, [____]]

Provide [Three][____] copies of the completed Final Acceptance Tests Reports, no later than [7][____] days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Engineer.

SD-07 Certificates

Inspection by Fire Protection Engineer; G[, [____]]

Concurrent with the Final Acceptance Test Report, certification by the Fire Protection Engineer that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports.

Fire Protection Engineer; G[, [____]]

The name and documentation of certification of the proposed Fire Protection Engineer, no later than 14 days [____] after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations.

Sprinkler System Installer; G[, [____]]

Submit data showing the Sprinkler System Installer has successfully installed systems of the same type and design as specified herein, 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. Provide NICET certification of the system technician. Contractor shall submit data along with submittal of the Fire Protection Engineer Qualifications.

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA as supplemented and modifies by this specification section.

Provide [six][____] manuals in accordance with NFPA 13. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. [Each service organization submitted shall be capable of providing [4][____] hour on-site response to a service call on an emergency basis.]

SD-11 Closeout Submittals

As-built drawings

As-built shop drawings, at no later than [14][____] days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed. Provide electronic drawings in dwg or pdf format.

On-site training

1.5 QUALIFICATIONS

1.5.1 Fire Protection Engineer

NOTE: Utilize the bracketed verbiage for USACE projects only. DO NOT utilize the bracketed verbiage for NAVFAC projects.

A Fire Protection Engineer is a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES)[or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.]

1.5.2 Sprinkler System Installer

NOTE: NICET Level IV certified technician shall be selected below when warranted by system complexity.

The Sprinkler System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Installation drawings, shop drawings and as-built drawings shall be prepared, by or under the supervision of, an system technician 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][Level IV] certification in Automatic Sprinkler System program or by a fire protection engineer.

1.6 QUALITY ASSURANCE

1.6.1 Material and Equipment Qualifications

Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

1.6.2 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.6.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's

name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.6.4 Field Fabricated Nameplates

**NOTE: Use the following paragraph where nameplates
are fabricated to identify specific equipment
designated on the drawings.**

ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 3 mm 0.125 inch thick, white with [black][_____] center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 25 by 65 mm one by 2.5 inches. Lettering shall be a minimum of 6.35 mm 0.25 inch high normal block style.

1.7 ACCESSIBILITY

**NOTE: The following requirement is intended to
solicit the installer's help in the prudent location
of equipment when he has some control over
locations. However, designer's should not rely on
it at all since enforcing this requirement in the
field would be difficult. Therefore, the system
designer needs to layout and indicate the locations
of equipment, control devices, and access doors so
that most of the accessibility questions are
resolved inexpensively during design.**

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

1.8 DELIVERY, STORAGE AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

PART 2 PRODUCTS

2.1 UNDERGROUND PIPING COMPONENTS

**NOTE: The contract drawings must show the service
connection details and the underground water mains
for the sprinkler system. The drawings must show
details of the water service point-of-entry into the
building and through the floor slab, and underground**

**piping restraints, including number and size of
restraining rods and thrust blocks.**

2.1.1 Pipe

Pipe shall comply with NFPA 24. Minimum pipe size shall be 150 mm 6 inches. Piping more than 1.50 meters 5 feet outside the building walls shall comply with Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.

**NOTE: Paragraphs 2.1.2 & 2.1.3 will be deleted if
underground valves are either not required or are
specified elsewhere.**

2.1.2 [Gate Valve and Indicator Posts

Installation shall comply with NFPA 24. 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.]

2.1.3 [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.]

2.1.4 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 block letters continuously and repeatedly over the 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.

2.2 ABOVEGROUND PIPING COMPONENTS

**NOTE: The following are basic restrictions on the
use of plastic pipe:**

**a. For Navy Projects CPVC may only be used in
residential occupancies where piping is concealed by
gypsum or plaster construction, and installed in
accordance with product listing.**

b. For USACE projects, plastic piping will only be

used in light hazard occupancies and in residential occupancies.

c. Plastic piping will not be used in combustible concealed spaces that are required to be sprinklered.

d. Plastic piping will not be used in spaces where ambient temperature exceed 65 Degrees C 150 Degrees F.

e. Plastic piping must be protected, as a minimum, by either (1) one layer of 9.525 mm 3/8 inch thick gypsum board, or (2) a suspended membrane ceiling with lay-in ceiling panels or tiles having a weight of not less than 1.7 kilogram per square meter 0.35 psf installed on metallic support grids, or by other method approved by UL. Method or protection of piping must be indicated and detailed in the contract documents.

f. Plastic pipe will not be used where water pressure surges could exceed 1207 kPa 175 psi.

g. Plastic piping will not be used in areas where the system could be subject to impact or physical stress or abuse.

h. Plastic piping can be used only in wet pipe sprinkler systems.

i. Quick response sprinklers will be used with plastic piping.

All components of the aboveground piping shall fully comply with the requirements and recommended practices of NFPA 13 and this specification section. Aboveground piping shall be steel [or copper][, copper, or plastic].

2.2.1 Steel Pipe

NOTE: Specify steel piping exposed to the weather or corrosive atmospheres to be galvanized or properly protected against corrosive effects. If galvanized pipe is specified all piping must be specified as schedule 40: Galvanized pipe must not be rolled grooved and cut grooving of Schedule 10 & 30 pipe is not permitted.

NOTE: For NAVFAC administered projects, any construction on Navy or Marine Corps facilities and any projects for the Air Force Air Combat Command (ACC) include requirement for pipe to be rigid.

Pipe shall be[rigid][black steel.][galvanized steel.] Steel piping shall be Schedule [10] or [40] for sizes less than 200 mm 8 inches [and Schedule

[10][30][40] for sizes 200 mm 8 inches or larger]. [Steel pipe shall be Schedule 40 for sizes less than 75 mm 3 inches and Schedule [10][30][40] for sizes 75 mm 3 inches or larger.] Fittings into which sprinklers, sprinkler riser nipples, or drop nipples are threaded shall be welded, threaded, or grooved-end type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings 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, 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.] [Roll grooving of galvanized pipe is prohibited]

2.2.2 Grooved Mechanical Joints and Fittings

Grooved couplings, fittings and grooving tools shall be products of the same manufacturer.

NOTE: Include the following for Army Corps projects. The use of flexible sprinkler hose is not permitted for NAVFAC administered projects, any construction on Navy or Marine Corps facilities and any projects for the Air Force Air Combat Command (ACC)

2.2.3 Flexible Sprinkler Hose

The use of flexible sprinkler hose is permissible.

2.2.4 [Plastic Pipe and Fittings

Plastic pipe shall be Chlorinated polyvinyl chloride (CPVC)]

2.2.5 Sprinklers

Provide nominal 12.7 mm 0.50 inch or 13.5 mm 0.53 inch orifice sprinklers. Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. [Provide [Concealed][Recessed][Flush][Pendent][Upright][Sidewall][Residential][quick response] sprinklers.] Sprinklers shall have a [brass][polished chrome][stainless steel][white polyester][_____] finish. Temperature classification shall be [ordinary][intermediate][_____] [as indicated]. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used. [Provide corrosion-resistant sprinklers and sprinkler guards as required by NFPA 13.] 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.

2.2.6 Valves

Provide valves of types approved for fire service. Valves shall open by counterclockwise rotation. [Provide [a rising stem][an OS&Y][a butterfly][a wall indicator] valve beneath each alarm.] Check valves shall

be clear opening swing-check type with inspection and access cover plate for sizes 200 mm 8 inches and larger. [Each control valve shall be electrically supervised; minimum contact ratings shall be 2.5 amps at 24 volts DC. Provide supervision against valve closure or tampering of valve.]

NOTE: For NAVFAC projects, alarm valves and water motor gongs are rarely necessary. These items should only be utilized when multiple remotely located risers serve a single building or when requested by the base fire department. Consult with the cognizant NAVFAC fire protection engineer before including these two items.

2.2.7 Pipe Supports

Provide Pipe hangers and supports and [Seismic Bracing] in accordance with NFPA 13.

2.2.8 [Alarm Valves

Provide variable pressure type alarm check valve, standard trim piping, pressure gauges, bypass, retarding chamber, testing valves, main drain, and other components as required for a fully operational system.]

2.2.9 [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.]

2.2.10 Fire Department Connections

Fire department connection shall be [projecting][flush] type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a [polished brass][chromium plated] finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 65 mm 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per [NFPA 1963][_____].

2.2.11 Backflow Prevention Assembly

Provide listed [reduced pressure principle][double check] valve assembly backflow preventer. 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."

2.2.12 [Excess Pressure Pump

NOTE: Use pump only when building water supply is subject to extreme water pressure fluctuations.

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 ALARM INITIATING AND SUPERVISORY DEVICES

NOTE: Water motor alarms and pressure alarm switches can be used only with an alarm check valve. Vane type waterflow indicators can be used with or without an alarm check valve and are often used for zoning of the system, e.g., building wings or floors.

To permit testing of each alarm device, the designer will indicate a separate inspector's test connection for each device. Coordinate selections and delete inapplicable devices.

2.3.1 Sprinkler Alarm Switches

Provide [pressure][and][or][vane] type flow switch(es) 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.][28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM][28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM][Vane type Alarm actuating devices shall have mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and shall instantly recycle.] [Flow switches for elevator power shunt shall have no retard feature. Provide properly lettered and approved metal sign to elevator flow switch stating the circuits' voltage, and identify the switch as an "Elevator Power Shunt Flow Switch".]

2.3.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.4 ACCESSORIES

2.4.1 Sprinkler Cabinet

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

2.4.2 Pipe Escutcheon

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 INSPECTION BY FIRE PROTECTION ENGINEER

The Fire Protection Engineer shall inspect the sprinkler system periodically during the installation to assure the sprinkler system is being provided and installed in accordance with the contract requirements and the approved sprinkler system submittal(s). The Fire Protection Engineer shall attend both the preliminary and final tests, and shall sign the test results. After the preliminary testing has been completed, the Fire Protection Engineer, shall certify in writing the system is ready for the final inspections and tests. This report shall document any discrepancies found and what actions will be taken to correct. Any discrepancy noted during the periodic site visits or the preliminary testing shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

3.2 UNDERGROUND PIPING INSTALLATION

The methods of fabrication and installation of the underground piping shall fully comply with the requirements and recommended practices of NFPA 13, NFPA 24 and the contract drawings.

3.3 ABOVEGROUND PIPING INSTALLATION

The methods of fabrication and installation of the aboveground piping shall fully comply with the requirements and recommended practices of NFPA 13 and this specification section.

3.3.1 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.3.2 Pendent Sprinklers

Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 25 mm 1 inch below the underside of the ceiling. Pendent sprinklers in suspended ceilings shall be a minimum of 150 mm 6 inches from ceiling grids.

NOTE: The following paragraph is unnecessary for
NAVFAC projects

3.3.3 [Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools shall be products of the same manufacturer. The diameter of grooves made in the field shall be measured using the method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. [A representative of the grooved couplings and fittings manufacturer shall conduct at least one onsite inspection of the piping installation to ensure the method of installation is in accordance with the manufacturer's requirements and recommended practices.]]

3.3.4 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. Bushings are prohibited.

3.3.5 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.3.6 Inspector's Test Connection

**NOTE: Designer will indicate location of the
inspector's test connections and all associated
valves on the contract drawings, and will provide
details of drain piping, if drain piping is needed.**

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. 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 floor drains, 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.]

3.3.7 Backflow Preventer Test Connection

Provide downstream of the backflow prevention assembly UL 668 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."

3.3.8 Drains

Main drain piping shall be provided to discharge [at a safe point outside the building][at the location indicated]. Auxiliary drains shall be provided as required by NFPA 13.

3.3.9 Installation of Fire Department Connection

Connection shall be mounted [on the exterior wall approximately 900 mm 3 feet above finished grade][adjacent to and on the sprinkler system side of the backflow preventer]. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

3.3.10 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Valve identification signs shall be minimum 150 mm wide by 50 mm high 6 inches wide by 2 inches high with enamel baked finish on minimum 1.214 mm 18 gauge steel or 0.6 mm 0.024 inch aluminum with red letters on a white background or white letters on red background. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.4 ELECTRICAL WORK

NOTE: Coordinate power and alarm requirements with the contract drawings and other specification sections.

Except as supplemented and modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. [Alarm signal wiring connected to the building fire alarm control system shall be in accordance with [Section 28 31 00.00 10 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP][and][Section 28 31 64.00 10 FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE.]] [28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM][28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM]

3.5 PIPE PAINTING AND COLOR CODE MARKING

NOTE: Designer will coordinate color code marking with Section 09 90 00 PAINTS AND COATINGS. Color code marking for piping which are not listed in Table I of UFGS Section 09 90 00 will be added to

the table.

Paint and color code mark sprinkler piping system as specified in Section 09 90 00 PAINTS AND COATINGS.

3.6 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24.

Submit request to schedule Preliminary Tests, no later than [14][_____] days prior to the proposed start of the tests. Upon completion of specified tests, the Contractor shall submit for approval a Preliminary Test Report.

3.6.1 Underground Piping

3.6.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24.

3.6.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24.

3.6.2 Aboveground Piping

3.6.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13.

3.6.2.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 65 mm 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pitot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop shall be compared to the manufacturer's data and the readings observed during the final inspections and tests.

3.7 FINAL ACCEPTANCE TEST

Final Acceptance Test shall begin only when the Preliminary Test Report has been approved. Submit request to schedule Final Acceptance Test, no later than [14][_____] days prior to the proposed start of the tests. Notification shall include a copy of the Contractor's Material & Test

Certificates.

NOTE: Do not use the following verbiage for NAVFAC projects

[The Fire Protection Engineer shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system.] This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. The Contractor shall submit the Final Acceptance Test Report as specified in the Submittals paragraph.

NOTE: Use the following verbiage for NAVFAC projects

An experienced technician regularly employed by the system installer shall be present during the inspection. The Fire Protection Engineer shall attend the final inspections and tests. 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.

3.8 ON-SITE TRAINING

NOTE: The number of hours of instruction should be determined based of the number and complexity of the systems specified.

Submit request to schedule the On-site Training, at least 14 [_____] days prior to the start of related training but prior to the final inspections and tests. The sprinkler contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of [_____] hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The On-Site Training shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --