
USACE / NAVFAC / AFCEA / NASA UFGS-21 22 00.00 40 (May 2010)

Preparing Activity: NASA New

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2012

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DIVISION 21 - FIRE SUPPRESSION

SECTION 21 22 00.00 40

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05/10

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SECTION 21 22 00.00 40

CLEAN AGENT FIRE EXTINGUISHING SYSTEMS 05/10

NOTE: This guide specification covers the requirements for clean agent fire extinguishing 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).

PART 1 GENERAL

NOTE: Edit this specification section as either a performance-designed system or a fully designed system as applicable.

(1) Highlight all concealed spaces on the drawings that require protection, such as spaces above suspended ceilings.

A fully designed system includes the items listed above and all additional information required that is required by NFPA 2001 for a fully operational system.

Select the appropriate Division 28 fire Detection and alarm section to address the project requirements.

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 are automatically 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 A53/A53M | (2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless |
| ASTM B88 | (2009) Standard Specification for Seamless Copper Water Tube |

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

- | | |
|-----------|--|
| MSS SP-58 | (2009) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation |
|-----------|--|

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

- | | |
|----------------|--|
| NASA-STD-5008A | (2011b) Protective Coating of Carbon Steel, Stainless Steel, and Aluminum on Launch Structures, Facilities, and Ground Support Equipment |
| RCBEA GUIDE | (2004) NASA Reliability Centered Building and Equipment Acceptance Guide |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- | | |
|-----------|---|
| NFPA 101 | (2012; Amendment 1 2012) Life Safety Code |
| NFPA 2001 | (2012) Standard on Clean Agent Fire |

Extinguishing Systems

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-595

(Rev C; Notice 1) Colors Used in
Government Procurement

UNDERWRITERS LABORATORIES (UL)

UL 2127

(1999; Reprint Mar 2001) Inert Gas Clean
Agent Extinguishing System Units

UL 2166

(1999; Reprint Mar 2001) Halocarbon Clean
Agent Extinguishing System Units

UL 536

(1997; Reprint Jun 2003) Flexible Metallic
Hose

1.2 SYSTEM DESCRIPTION

1.2.1 Design Requirements

Submit [Installation Drawings](#) for Clean Agent Fire Protection Systems in accordance with the requirements of [NFPA 2001](#). Include details of equipment layout and design. Indicate the general physical layout of all controls, [manual actuation station\[s\]](#), and internal tubing and wiring details. Provide electronic drawings in Microstation.dgn format or AutoCAD.dwg format. If the electronic files are AutoCAD format, only use standard AutoCAD fonts and line styles and furnish the pcp file.

Submit Design Analysis and Calculations for Fire-Protection Systems including spray areas, hazard by class, and pressure calculations.

1.2.1.1 System Layout

Give full consideration to built-in spaces, piping, electrical equipment, ductwork, and all other construction and equipment for the layout of the system.

Design the total flooding system to a concentration of [_____] percent for [_____] minutes.

1.2.1.2 Mandatory System Approvals

Provide devices and equipment of make and type listed by the Underwriters Laboratories, Inc. (UL), [[UL 2127](#),] [[UL 2166](#),] or Factory Mutual (FM) approved. In the UL and FM publications, consider the advisory provisions to be mandatory. Reference to the "authority having jurisdiction", AHJ is interpreted as the [_____].

Provide an approved high-pressure total flooding type Fire-Extinguishing system conforming to [NFPA 2001](#). Acceptable product trade names are FM-200, Novec-1230 (Sapphire), Intergen, HCFC, [_____] , or approved equal.

**NOTE: Select the appropriate Division 28 Fire
Protection and Alarm section to address the project
requirements**

Conform electrical work associated with the system to comply with Section 28 31 00.00 10 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP.

1.2.2 Performance Requirements

Provide construction type, test, and mark of high-pressure cylinders in accordance with U.S. Department of Transportation specifications for seamless steel cylinders.

Each cylinder is to be provided with a safety device to relieve excess pressure safely, in advance of the rated cylinder test pressure. Devices are to be Interstate Commerce Commission approved frangible safety disks.

Provide cylinder support racks that anchor to walls and floors.

Main System: Arrange system for fully automatic and manually operated electric control operation, with operating controls of the enclosed release type to prevent accidental operation. Also provide for [a] manual actuation station[s] and keyed override operations.

1.3 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.

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.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Previous Product Installation[; G][; G, [____]]

SD-02 Shop Drawings

High-Pressure Cylinders[; G][; G, [____]]

Piping Materials[; G][; G, [____]]

Pipe Hangers and Supports[; G][; G, [____]]

Pressure Alarm Switch[; G][; G, [____]]

Nozzle[; G][; G, [____]]

Manual Actuation Station[s]

Installation Drawings[; G][; G, [____]]

SD-03 Product Data

Calculations[; G][; G, [____]]

Components[; G][; G, [____]]

Escutcheons

SD-06 Test Reports

Test Procedure[; G][; G, [____]]

Preliminary Tests[; G][; G, [____]]

Formal Tests[; G][; G, [____]]

SD-07 Certificates

Certificates of Compliance[; G][; G, [____]]

SD-10 Operation and Maintenance Data

Operating Instructions[; G][; G, [____]]

Operation and Maintenance Manuals[; G][; G, [____]]

SD-11 Closeout Submittals

Record Drawings[; G][; G, [____]]

1.4 PREDICTIVE TESTING AND INSPECTION TECHNOLOGY REQUIREMENTS

NOTE: The Predictive Testing and Inspection (PT&I)

tests prescribed in Section 01 86 12.07 40
RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL
SYSTEMS are MANDATORY for all [NASA] [_____] assets
and systems identified as Critical, Configured, or
Mission Essential. If the system is non-critical,
non-configured, and not mission essential, use sound
engineering discretion to assess the value of adding
these additional test and acceptance requirements.
See Section 01 86 12.07 40 RELIABILITY CENTERED
ACCEPTANCE FOR MECHANICAL SYSTEMS for additional
information regarding cost feasibility of PT&I.

This section contains systems and/or equipment components regulated by NASA's Reliability Centered Building and Equipment Acceptance Program. This program requires the use of Predictive Testing and Inspection (PT&I) technologies in conformance with RCBEA GUIDE to ensure building equipment and systems installed by the Contractor have been installed properly and contain no identifiable defects that shorten the design life of a system and/or its components. Satisfactory completion of all acceptance requirements is required to obtain Government approval and acceptance of the Contractor's work.

Perform PT&I tests and provide submittals as specified in Section
01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS.

1.5 QUALITY ASSURANCE

The project services of the kind indicated being provided by the State Certified Contractor, are to include but not limited to, supervision of the installation, all necessary balancing and adjustments, and performance of all testing at the project site.

System Specialist is considered certified when the specialist holds a valid Special Hazards Suppression Systems, Level IV Certification from the National Institute for Certification in Engineering Technologies (NICET) 1014-7, or is licensed by the State of [_____] as a [Contractor Class I] in accordance with [_____] State statutes and holds a current Certificate of Competency.

Certification of other recognized agencies with equivalent requirements may be considered. Provide evidence of the Contractor's State Certification and the basis of certification to the [Contracting Officer] [Contract Administrator] for approval prior to any work being performed at [Kennedy Space Center] [_____].

**NOTE: Subject to project type and scope, keep the
section reference below, or delete, and insert the
applicable section for the type of alarm and
detection system desired.**

Perform all work by or under the direct supervision of the certified contractor[.][, the same certified contractor providing work under Section [28 31 00.00 10 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP [_____]]].

Design clean agent extinguishing system as per NFPA 2001. Submit plans and

calculations for approval by the Government before installation. Submit [Certificates of Compliance](#) for the following items showing conformance with the referenced standards contained in this section:

- a. Piping Materials and Supports
- b. High-Pressure Cylinders
- c. Escutcheons
- d. Pipe Hangers and Supports
- e. Pressure Alarm Switch
- f. Internal Cleaning and Swabbing of Pipe

1.5.1 [Previous Product Installation](#)

Submit the names, locations, and client contact information of five (5) successful previous projects of similar size and scope that the installer has constructed using the manufacturer's submitted products for this project.

1.5.2 [Installation Drawings](#)

Annotate clean agent extinguishing system piping layout with reference points for design. In field wiring diagrams, show locations of devices and points of the system. Prepare working drawings on sheets not smaller than [A0 1189 by 841 mm 30 by 42 inches](#), in accordance with the requirements for "Plans" as specified in [NFPA 2001](#). Include data essential to the proper installation of each system. Integrate with alarm and detection system specified.

1.5.3 [Calculations](#)

Submit clean agent discharge calculations verifying total storage requirements, flooding concentrations, discharge times, flow through the piping network, pipe sizes, and [nozzle](#) orifice sizes, in accordance with the manufacturer's listed design manual and [NFPA 2001](#).

1.5.4 [Record Drawings](#)

Upon completion, and before final acceptance of the work, submit a complete set of as-built (record) working drawings, including complete as-built circuit diagrams, of each clean agent system for record purposes. Provide record working drawings [no smaller than [A0 1189 by 841 mm 30 by 42 inches](#), reproducible with title block [200 by 100 mm 8 by 4 inches](#) similar to full size contract drawings] [in [dgn.] [dwg.] electronic format].

1.6 SPECIAL HAZARDS SUPPRESSION SYSTEMS

Provide the services of a Certified Automatic Sprinkler Specialist (CASS) thoroughly experienced in Clean Agent Suppression System installations on site, to perform or directly supervise the installation, make all necessary adjustments, and perform all tests on the wet pipe sprinkler system at the site.

A CASS is considered certified when the specialist holds a valid System Layout, Level IV Certification from the National Institute for

Certification in Engineering Technologies (NICET) 1014-7[or is licensed by the State of [_____] as a Contractor Class I in accordance with [_____] State Statutes, and holds a current Certificate of Competency].

Certification of other recognized agencies with equivalent requirements may be considered. Provide evidence of the Contractor's State Certification and the basis of certification to the [Contracting Officer] [Contract Administrator] for approval prior to any work being performed.

PART 2 PRODUCTS

2.1 EQUIPMENT

Only use UL-listed or FM-approved equipment and devices in the systems.

Design and construct the system as a total-flood system to include a fixed supply of extinguishing agent connected to properly sized, fixed piping with fittings and nozzles to direct this agent into the protected area.

2.2 COMPONENTS

2.2.1 Piping

Provide only galvanized, ferrous piping, Schedule 40 manifolds and distribution [piping materials](#) conforming to [ASTM A53/A53M](#), nonferrous drawn seamless copper tubing conforming to [ASTM B88](#), and flexible metallic hose conforming to [UL 536](#).

Reduce pipe sizes in the fitting. Do not use flush bushings. Fuse brazed joints, when used, with an alloy with a melting point above [537 degrees C](#) [1,000 degrees F](#).

Provide pipe and fittings having a minimum bursting pressure of [34.47 megapascal](#) [5,000 psi](#). For [12.7 mm 1/2-inch](#) and [19.05 mm 3/4-inch](#) iron pipe size (ips), provide Schedule 40. For [25.4 mm 1 inch](#) or greater, use only Schedule 80 pipe. Standard malleable iron banded fittings or ductile iron fittings are to be used up through [19.05 mm 3/4-inch](#) ips. Use extra heavy malleable iron or ductile iron fittings through [50.8 mm 2-inch](#) ips. Use forged steel fittings in all sizes over [50.8 mm 2 inches](#).

Permanently mark discharge nozzles to identify the nozzle and to show the equivalent single orifice diameter regardless of shape and number of orifices. Design discharge nozzles to uniformly distribute the clean agent throughout the hazard area.

Provide [pipe hangers and supports](#) conforming to [MSS SP-58](#), adjustable type, zinc-coated. Space as follows:

Nominal Pipe Size (mm)	Maximum Spacing (meter)
25.4 and under	2.135
31.8	2.438
38.1	3.048
50.8	2.743
(inches)	(feet)
1 and under	7

1.25	8
1.5	10
2	9

2.2.2 Escutcheons

Provide approved-type escutcheons for piping passing through floors, walls, and ceilings, consisting of one-piece or split-type. Provide chrome plated escutcheons where pipe passes through finished ceilings. Other escutcheons may be steel or cast iron, with aluminum paint finish. Securely fasten escutcheons in place with setscrews or other positive means.

2.3 SUPERVISORY SWITCH

2.3.1 Low Pressure Alarm Switch

Provide the clean agent tanks with a low [pressure alarm switch](#) to warn of clean agent tank depressurization.

2.4 CONTROL PANEL

[Provide a separate control panel for the clean agent system.][Route all supervision and control through the facility fire alarm panel.

] [Provide the suppression system control panel with power-on, alarm, supervisory, and trouble indicating lights plainly visible when the cabinet is closed; and containing the following functions, accessible only by unlocking and opening the unit:

Alarm Silence

Trouble Silence

Supervisory Silence

Power On-Off (If standard by the manufacturer)

Alarm/Trouble Acknowledge

Auxiliary Devices (AHU shutdown relay) Maintenance By-pass Switches

System Reset

Manual Actuation Station

Provide the suppression system control panel with all components necessary to monitor and supervise all initiating device circuits. When any detector, manual alarm station (pull box), pressure switch, etc., connected to the control panel is activated, activate the control panels visual alarm indication and audible signal. (This causes all notification appliances to be activated, including all associated auxiliary control functions.) The control panel is to visually indicate the addressable device or zone in alarm and transmit an alarm condition to the remote Central Fire Monitoring System. Separate audible and visual notification appliance circuits. Provide audible and visual notification appliance circuits having sufficient capacity to operate all devices connected, plus 25 percent minimum spare capacity. Visual notification appliances are to remain operational until the panel has been reset.

Provide the control panel containing all components necessary to monitor and supervise all supervisory device circuits. When any valve tamper switch, pressure switch, or other supervisory device connected to the control panel is activated, they are to activate the control panel supervisory visual indication and supervisory audible device. The control panel is to visually indicate the addressable device or zone in supervisory alarm and transmit a supervisory condition to the remote Central Fire Monitoring System.

Also, provide the control panel containing all components necessary to operate and supervise the circuits for annunciator panels indicated and auxiliary devices controlling equipment such as ventilating fans, air handling units, fan coil units, damper motors, solenoids, magnetic door holders, etc. Circuits for auxiliary control relays are to be supervised to within 914 millimeter 3 feet of the the device to be controlled in accordance with NFPA 101. Include a maintenance by-pass switch for all auxiliary control devices. Supervise the by-pass to report trouble when in the maintenance by-pass position.

Design the panel to monitor and report as trouble, open supervised circuits, ground faulted supervised circuits, removal of detector or device, removal or failure of control panel module, maintenance by-pass switch activated, loss of primary power, power supply trouble, low battery voltage, loss of battery voltage, and activation of the alarm silence switch. All trouble signals are to be identified by initiating, notification appliance, auxiliary control, or signaling line device. Trouble signals are to activate the control panel trouble visual indication and trouble audible devices, and send a trouble signal to the remote Central Fire Monitoring System.

Provide alarm/trouble reset switches to reset a cleared device in alarm or trouble. Alarm or trouble signals are not to be self-restoring without activating the switch.

Alarm, supervisory, and trouble silence switches are to silence the alarm and trouble audible's. Either switch placed in other than the normal position is to provide the following:

- a. Report as an alarm, supervisory, or a trouble to the Central Fire Monitoring System.
- b. Transfer audible signal to a panel lamp visual indication.
- c. Re-ring the trouble audible if the problem has been cleared, but the switch has been left in the silence position.

When the alarm silencing switches are in the silence position, subsequent alarms are to reactivate the notification appliances, with the strobes remaining operational until the reaction control panel is reset.

Control panel is to be suitable for use with the detectors and manual alarm stations, and other preaction devices specified in this section.

Provide a control panel having a normally closed set of dry contacts, single pole, double throw (SPDT), which opens for trouble conditions and a normally open set of dry contacts single pole, double throw (SPDT), which closes under alarm conditions for connection to the Central Fire Monitoring System.

Provide continuous duty relays with self-cleaning contacts of silver or an alloy of equivalent performance. Suitably protect supervisory relays against dust by individual covers. For all relays that provide external functions, such as remote reporting, control device activation, notification appliance activation, ensure at least one (1) set of space contacts are provided. Permanently mark relays with the coil resistance, operating-current range, and internal pin connections using standard pin numbers.

Control panel, terminal cabinets and battery cabinets (when used) are to be steel, provided with a hinged cover and an integral pin-tumbler cylinder lock with removable core that accepts the key presently in use with other control units existing in the area; lock core is provided by the government. Paint cabinets with a prime coat and one or more finish coats of scratch-resistant baked enamel. Provide red finish coat unless otherwise indicated. An etched metal or engraved laminated plastic identification plate labeled, "Suppression Control Cabinet", is to be permanently affixed to the cabinet door of the preaction control unit to identify the cabinet as a preaction control system cabinet. For cabinets painted red, provide an identification plate with white letters on a black background. For cabinets not painted red, the identification plate is to have white letters on a red background.

Provide a system which operates from a power supply with 120 grounded Vac int and 24 Vdc output, satisfactorily with power input voltage varying from 85 to 110 percent of nominal value. Ensure that the power supply output is capable of powering all initiation, signaling, annunciation, and control devices during alarm condition with 25 percent minimum spare capacity. [If supplied within the cabinet, ensure the power on-off switch is to disconnect all power sources to the control panel, and that the on-off switch has DC rated contacts.]

Provide batteries, charger, and power transfer equipment which supplies the means of automatically supplying the entire preaction system with battery backup power in event of a primary power system failure, and switches to battery power in the event of AC power failure, and switches back to AC power upon return of primary power. Provide a control panel which operates when the backup batteries are disconnected for any reason, and controls charging currents and floating voltage levels to maintain batteries in optimum condition. Provide capability to recharge batteries in event of discharge. Fuse wiring to protect against battery over-current and polarity reversal. Primary power, battery, or charging equipment failure is to activate a preaction control panel trouble signal and visual indication.

Provide sealed and spill-proof battery modules (no corrosive fumes). Utilize only batteries which are listed for preaction service and suitable for high discharge currents required under alarm conditions, sized to operate the preaction and detection system (including voice evacuation systems and UV/IR flame detectors) in normal supervisory condition for 24[48][72] hours minimum, then operate the system in the alarm mode for [5]10[15] minutes, minimum.

] PART 3 EXECUTION

3.1 INSTALLATION

Install materials and equipment in accordance with NFPA 2001. Provide each system complete and ready for operation.

Provide each system with an approved pressure-relief device designed to operate between 13.79 and 22.75 megapascal 2,000 and 3,300 psi and located between the storage cylinder manifolds and any normally closed valve.

3.1.1.1 Warning Signs

Provide 3-layer red-white-red micarta, engraved to show white letters on a red background, warning signs. Letters are to be uppercase. Warning signs are to be 0.3175 cm 1/8-inch thick with beveled edges.

3.1.1.1.1 Inside Control Room

Permanently affix a sign adjacent to every audible/visual alarm activated due to agent discharge, reading:

WARNING

**WHEN THIS STROBE IS LIT,
RELEASE OF FIRE SUPPRESSION AGENT WILL OCCUR WITHIN 60 SECONDS**

Make letters for "WARNING" 3.81 cm 1-1/2-inch tall, and all other lettering 1-inch tall.

3.1.1.1.2 Protected Space

Permanently affix a sign adjacent to every audible/visual alarm activated due to agent discharge, reading:

WARNING

**THIS SPACE IS PROTECTED BY A CLEAN AGENT
EXTINGUISHING SYSTEM. DO NOT ENTER
WITHOUT AUTHORIZATION DURING OR
AFTER DISCHARGE. THIS STROBE
INDICATES DISCHARGE.**

Make letters for "WARNING" 3.81 cm 1-1/2-inch tall, and all other lettering 1-inch tall.

3.1.1.1.3 Manual Activation or Release Station

Place a sign at every location where manual operation of the system may occur, reading:

WARNING

**ACTUATION OF THIS DEVICE WILL CAUSE
FIRE SUPPRESSION GAS TO DISCHARGE. BEFORE
ACTUATING, ENSURE THAT PERSONNEL ARE
CLEAR OF THE AREA.**

Make letters for "WARNING" 1.905 cm 3/4-inch tall, and all other lettering 0.9525 cm 3/8-inch tall.

3.1.2 System Control

3.1.2.1 Controls

NOTE: Select the appropriate Division 28 Fire Protection and Alarm section to address the project requirements

Provide an electrical and mechanical actuating control system contained in a fire alarm panel specified in Section 28 31 00.00 10 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP as modified below.

3.1.2.2 Suppression System Saving/Disconnect Switch

Connect the positive and negative conductors of the Class B solenoid/actuator/electric release head circuitry in series to a lock switch. Provide and install the switch in an enclosure inside the facility. A clearly visible sign on the enclosure, or immediately adjacent, is to explicitly indicate its purpose as "FIRE SUPPRESSION SYSTEM SAVING SWITCH".

3.1.3 Electrical Work

NOTE: Select the appropriate Division 28 Fire Protection and Alarm section to address the project requirements

Electrical work is specified in Section 28 31 00.00 10 FIRE DETECTION AND ALARM SYSTEM, DIRECT CURRENT LOOP.

3.1.4 Operating Instructions

Submit [Operating Instructions](#) for Clean Agent Fire Protection Systems consisting of raised or embossed white letter on red rigid plastic or enameled steel background and of adequate size to permit them to be easily read.

Provide operating instructions at each remote control station. Instructions are to clearly indicate necessary steps for the operation of the system.

Submit [six] [_____] copies of the [Operation and Maintenance Manuals](#) 30 days prior to testing the Clean Agent Fire Protection Systems. Update and resubmit data for final approval no later than 30 days prior to contract completion.

3.1.5 Field Painting

Touch-up painting is to match equipment manufacturer's original paint.

[Paint all equipment, piping and other components of the system red per NASA-STD-5008A, Zone 5, conforming to FED-STD-595, Color 11105.](#)

3.2 FIELD QUALITY CONTROL

Conduct testing to determine conformance with the requirements in the presence of the Contracting Officer.

3.2.1 Test Procedure

Prepare and submit the clean agent system test procedure to the Contracting Officer for approval 30 days prior to the planned preliminary tests.

3.2.2 Preliminary Tests

NOTE: If the specified system is identified as critical, configured, or mission essential, use Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS to establish predictive and acceptance testing criteria, and delete the second paragraph and add the following paragraph.

Perform PT&I tests and provide submittals as specified in Section 01 86 12.07 40 RELIABILITY CENTERED ACCEPTANCE FOR MECHANICAL SYSTEMS.

Pneumatically test each piping system at 1.034 megapascal 150 psi gage to ensure no leakage or reduction in gage pressure after 2 hours. Use the discharge of breathing air from each system discharge nozzle to test discharge nozzles. Remote control stations, and all other components and accessories are to be tested individually to demonstrate proper functioning. At the completion of tests and corrections, submit a signed and dated certificate to the [Contract Administrator] [Contracting Officer] attesting to the satisfactory completion of all testing and that the system is in operating condition.

3.2.3 Formal Tests

At a time to which the Government has agreed, the Government Fire Protection Engineer will witness formal tests and approve systems before they are accepted. Ensure the presence of an experienced technician regularly employed by the system installer during the inspection. At this inspection, repeat any or all of the required tests, as directed by the [Contracting Officer] [Contract Administrator]. Suppression agent, instruments, personnel, appliances, and equipment for testing are to be furnished by the Contractor at his expense. Perform a fan test witnessed by the Government wherein the enclosure integrity is required to perform in accordance with NFPA 2001, Annex C.

3.2.4 Manufacturer's Representative

Provide an experienced manufacturer's field engineer to supervise installation and testing of the system.

-- End of Section --