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1.0 PURPOSE AND SCOPE

(5.1.1)

This procedure implements the criteria necessary for the design, upgrade, and modification of fire protection systems at Tank Farm Contractor (TFC) facilities in accordance with DOE-STD-1066-99 and DOE-STD-1088-95. It includes requirements necessary for conformity with existing Hanford Site installations.

This procedure applies to all new designs, upgrades, or modifications prepared for or by TFC, its subcontractors, managed facilities, programs, projects, and activities. This procedure does not apply to structures that do not require fire protection systems.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 RESPONSIBILITIES

3.1 Project/Document Managers

Managers of projects and/or documents that design, upgrade, or modify fire protection systems are responsible for:

1. Ensuring that the applicable requirements of this procedure are incorporated into their project/documentation.
2. Ensuring that TFC Safety is consulted on fire protection issues and is involved in the review/approval process.

3.2 TFC Safety

1. TFC Safety is responsible for maintaining a staff of qualified fire protection engineers for assisting in the implementation of this procedure.
2. TFC Safety fire protection engineers are responsible for providing direction and support on fire protection design issues, as well as timely review and approval of documentation required by this procedure.

4.0 STANDARD

1. In accordance with the responsibilities of Paragraph 3.0, personnel will use the appropriate sections of this procedure and [Attachment A](#) for the design, upgrade, or modification of fire protection systems.
2. All modifications or new installations of fire systems shall be reviewed and approved by a qualified fire protection engineer in the TFC safety organization to ensure compliance to fire protection orders, codes, and standards. Personnel should consult with TFC Safety early in the design process to ensure that the systems will meet the criteria in Attachment A. All new fire systems and system modifications are required to be permitted by the Office of the Fire Marshal.

3. The fire protection related codes and standards in effect when facility design commences (code of record) shall remain in effect for the life of the facility unless:

- A significant hazard that endangers the building occupants or the public is identified
- Substantial upgrades or modifications are made to the fire protection systems.

In these cases, the facility shall be upgraded to the current requirements of the applicable code or standard. Each design, upgrade, installation, and modification shall be maintained in accordance with the code of record as well.

4. All fire protection designs shall use equipment that has been tested and listed or approved by a nationally recognized testing laboratory for its intended use, whenever available. The TFC Safety may issue a written approval for substitute/equivalent items if no listed or approved item can be procured because the equipment has never been tested for fire protection use.
5. All equipment components specified in designs shall be compatible with existing equipment and installed as required by the applicable National Fire Protection Association (NFPA) codes and standards.
6. Fire protection systems shall be compatible with and connected to the Hanford fire alarm system.

5.0 SOURCES

5.1 Requirements

1. [ORP M 420.1-1](#), "ORP Fire Protection Program." (S/RID)

5.2 References

No documents external to this standard and Attachment are required for compliance.

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ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**1.0 INTRODUCTION**

The design of fire alarm and suppression systems at TFC facilities shall be in accordance with National Fire Protection Association codes, standards, and other documents referenced herein. The only suppression system requirements included in this Standard are for sprinkler and water mist systems because the TFC does not have nor plan any other types. If this fact changes in the future, the appropriate code requirements will be added.

2.0 FIRE ALARM SYSTEMS**2.1 General**

1. Fire alarm systems shall be designed and constructed in accordance with the following, as applicable:
 - a. Department of Energy orders and directives, including, but not limited to:
 - ORP M 420.1-1, "ORP Fire Protection Program."
 - b. The latest edition of the National Fire Protection Association (NFPA) codes and standards, include, but not limited to:
 - NFPA 70, "National Electrical Code®," [2005 edition](#)
 - NFPA 72®, "National Fire Alarm Code®"
 - NFPA 101®, "Life Safety Code®," [2000 edition](#)
 - NFPA 750, "Water Mist Fire Protection Systems"
 - NFPA 1221, "Public Fire Service Communication System."
 - c. Other standards and requirements, including:
 - 29 CFR 1910, "Occupational Health and Safety Standards"
 - 29 CFR 1926, "Safety and Health Regulations for Construction"
 - DOE-STD-1066-99, "Fire Protection Design Criteria."
 - DOE-STD-1088-95, "Fire Protection for Relocatable Structures"
 - Underwriter's Laboratory Product Directories (including the periodic supplements)
 - Factory Mutual Research Corporation Approval Guide
 - WAC 173-303, "Hazardous Waste."
 - d. The requirements in this document.
2. The word "municipal," as used in NFPA publications and in this standard, shall be construed to refer to the Hanford Site.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

3. Contractors installing new/unique fire alarm control panels (after obtaining approval from TFC Safety) on the Hanford Site shall provide:
 - a. Certified copies of applicable as-built programming files
 - b. Factory authorized software/programmer training for a minimum of two engineers
 - c. Factory authorized operations/troubleshooting training for technicians and firefighters.
4. The building fire alarm control panel(s) should be in a convenient location near the main entrance and shall be readily accessible and readily visible.
5. Design and installation of fire alarm systems shall be performed by a qualified company/individual. Upon request, the company/individual shall submit proof of professional engineer's license and/or an installer's certificate of experience documenting the installer's qualifications for design, installation, and/or programming of fire alarm systems and equipment of the types being obtained. Supplemental information requested may include, but not limited to:
 - a. Names, addresses, and telephone numbers for completed system designs and/or installations of similar systems that have been in use in similar service for a minimum of two years
 - b. Proof of manufacturer's training for the fire alarm control panel being obtained
 - c. Proof of manufacturer's authorization for programming the fire control panel.
6. An operational test shall be performed on all fire alarm installations before performing the final acceptance test procedure to ensure the acceptance test procedure can be conducted without the need for additional troubleshooting or delays. The operational test should be performed by the assigned installer(s) and supported by the Hanford Site Information Resource Management/Telecommunications Radio Maintenance group (Radio Maintenance), Hanford Fire Department, and other assigned contractor personnel, as needed. The operational test should be documented in the acceptance test procedure.
7. A documented acceptance test shall be performed on every new/modified fire alarm system installation to verify all system functions. As a minimum, the acceptance test procedure must be reviewed and approved by TFC Safety and the Hanford Fire Department. The acceptance test procedure should be performed by the installer(s) and supported by Radio Maintenance, the Hanford Fire Department, and other assigned contractor personnel, as needed.
8. Jumper cuts and mapping/programming must be shown on drawings.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

9. Drawings must be approved by TFC Safety prior to the start of installation.
10. As-built drawings shall be approved and issued prior to final acceptance test procedure.

2.2 Fire Alarm Control Panels

1. Fire alarm control panel.
 - a. Interface completely with the Hanford Site radio fire alarm reporter box to ensure the Hanford Fire Department receives all alarm and trouble signals
 - b. Provide at least one alarm indicator for each floor or each fire zone of the building
 - c. Provide a minimum of two spare zones or 10% of the functioning zones for future expansion (new panel installations).
 - d. Provide supervision of fire sprinkler systems, including, but not limited to, riser main control valve, post indicator valve(s), backflow preventer valves, and dry pipe system air pressure.
 - e. Process all remote operation function(s), i.e., ventilation, air conditioning, elevator recall, computer shutdown, etc., in response to a fire alarm initiating device.
 - f. Be housed in key-locked control cabinets. Locks furnished with this equipment shall be Corbin Cabinet Lock, Division of Emhart Corporation, Key Cat. No. 60, or Hanford Fire Department approved equivalent.
2. Fire alarm control panel zoning criteria.
 - a. There should be a one-for-one relationship between fire alarm control panel zone numbers and radio fire alarm reporter zone numbers.
 - b. Water flow signal shall be Zone #1 unless approved otherwise by TFC Safety.
 - c. Fire alarm zones may be based on geographic location within the building. This implies that different types of initiating devices may be included on a single zone if they indicate an alarm within a defined and logical geographical zone.
 - d. The fire alarm control panel system TROUBLE signal shall be transmitted directly from the fire alarm control panel's common trouble/supervisory contacts to the radio fire alarm reporter trouble terminals.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

- e. The fire alarm control panel zone assignment shall be coordinated with the Hanford Fire Department and the design engineer and approved by TFC Safety. Preferred fire alarm control panel zoning order is as follows:

<u>Grouping</u>	<u>Device Function</u>
First	Automatic sprinkler system water flow
Second	Other suppression systems (e.g., deluge, Halon, carbon dioxide, foam)
Third	Manual pull stations
Fourth	Fire detectors (e.g., smoke, thermal)
Spare Zone(s)	Spare zones, provided for future expansion
Last	Trouble/supervisory devices (work backwards from the last zone on panel)

3. Bypass switch criteria.
- a. New fire alarm control panel installations shall be provide with bypass capability. The bypass switch(es) shall be supervised in accordance with NFPA 72 requirements.
- 1) Bell bypass switch. Ensures sounding bells do not disrupt occupancies during testing. (The term "bell" is used to designate any notification appliance.) The bypass switch shall initiate a trouble condition when activated.
 - 2) Remote function bypass switch. Prevents remote systems (such as HVAC) from being impacted during testing. The bypass shall initiate a trouble condition when activated.

2.3 Manual Fire Alarm Boxes

1. Manual fire alarm boxes (pull stations) shall be listed or approved, non-break glass, double-action type. Manual fire alarm boxes shall not be self-restoring.
2. Manual fire alarm boxes shall be located in accordance with NFPA 101® and NFPA 72. Buildings requiring protection shall have at least one pull station at each floor level. Pull station coverage shall not exceed 929 square meters (10,000 square feet) of floor area.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**2.4 Heat/Smoke Detection**

1. Detectors shall be located and installed in accordance with NFPA 72 and manufacturer's instructions.
2. Special installations shall be determined and approved by TFC Safety.
3. Detectors activating special extinguishing systems should use zone verification or be cross-zoned.
4. Photoelectric smoke detectors should be used instead of ionization detectors.
5. Photoelectric smoke detectors should be used in areas where high concentration of smoke may be produced by a fire.
6. Ionization smoke detectors should be used if there is a potential for a flame-type fire (clean burning with little smoke).
7. Concealed detectors shall be provided with a remote alarm indicator light that will allow quick identification of the alarm source. The detection location and remote alarm light shall be labeled in accordance with NFPA 72.

2.5 Notification Appliances

1. Notification signals for occupant evacuation shall consist of audible and/or visible signals.
2. A survey shall be made to ensure signals can be heard under normal background conditions. This shall be the responsibility of the contractor/installer.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

3. Audible indicating devices shall consist of single stroke chimes or gongs and shall be sufficient in number and intensity to produce a sound level of at least 10 decibels above maximum expected background noise. Audible alarms shall not subject personnel to any exposure of sound greater than 115 decibels. The audible indicating devices shall provide a march time rate of 120 strokes per minute. When background noise levels normally exceed 100 decibels in operating conditions, a visual alarm device is needed in addition to the audible device(s). Any change to the march time rate to accommodate visual alarm devices shall be coordinated through TFC Safety, but in no case shall the march time rate be less than 60 strokes per minute.
4. Visual fire alarm/evacuation appliances, in addition to audible appliances, shall be installed in those buildings accessible to the public or where it may be anticipated that hearing-impaired persons are employed.
5. Visual indicating appliances shall be located and installed in accordance with
 - NFPA 72, "National Fire Alarm Code"
 - NFPA 101®, "Life Safety Code"
 - 28 CFR 36, "Americans with Disabilities Act (ADA)."

2.6 Wiring

1. Fire protective signaling circuits shall be designed and installed in NFPA 70, Article 760, "Fire Alarm Systems."

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

2. Wiring for fire protective signaling circuits shall comply with NFPA 70, NFPA 1221, and the following.
 - a. Splices in fire alarm wiring shall be made mechanically strong by use of pressure-type solder less connections. Connectors shall be installed according to the manufacturer's instructions and with the proper tool for the connector or terminal. Splices in wiring systems should be avoided.
 - b. Terminal ends of approved stranded conductors should be completed with or without crimp-on terminal lugs.
 - c. Conductors for interior, non-power limited, and power limited auxiliary fire alarm circuits shall be no smaller than No. 16 American wire gauge for single conductors and No. 18 American wire gauge for multi-conductor cables.
 - d. Single conductors size No. 14 American wire gauge and larger installed in non-power limited circuits shall have THHN/THWN insulation.
3. Wiring may be installed in intermediate metal conduit, rigid galvanized steel conduit, electrical metallic tubing, or non-metallic sheathed cable. Plenum rate cables may be used without conduit in the concealed spaces in office buildings of 15,000 square feet or less.
4. Two separate and dedicated circuit breakers shall be provided – one for fire alarm control panel, and one for the radio fire alarm reporter box. The color of the fire protection breakers shall be red (paint, tape, etc.) and fitted with a suitable guard requiring manual removal before the breakers can be operated.
5. All grounding shall be in the fire alarm control panel.
6. Junction box covers associated with fire alarm systems shall be identified by decals or red paint.
7. Relays, switches, pushbuttons, terminals, terminal boards, etc., in the fire alarm control panels shall be marked and identified and properly coordinated with the nomenclature on the drawings.
8. Signaling conductors between the fire alarm control panel and radio fire alarm reporter box shall be separated from other conductors to ensure that electromagnetic interference is eliminated.
9. Voltages above 50 volts are not permitted within the fire alarm control panel except for the panel power, which shall be protected from personnel exposure.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**2.7 Device and Wire Labels**

1. Table A-1 is provided as guidance for labeling devices and wires. When modifying existing systems, the existing labeling convention should be maintained. Some new or existing facilities may have more stringent labeling conventions.
2. When choosing the name for the wire to be labeled, consideration should be given to the function of the circuit. Some examples of common labels are given in Table A-1.
3. Device and wire labels inside an enclosure.
 - a. Devices within enclosures are assigned an alphanumeric identifier dependent on their location within the enclosure. If the device is located in row 1, column A, then label the device "1A." Device "1A" is usually located in the upper left-hand corner of the enclosure.

Table A-1. Examples of Common Wire Labels.

TYPE OF CIRCUIT	ALPHA-NUMERIC IDENTIFIER
BELL/GONG/CHIME	B1-* B1-*
ZONE (MODULE TO FIELD DEVICE)	1A1 1A2
FCP TO RFAR TROUBLE CIRCUIT	TR TR
FCP TO RFAR ZONE CIRCUITS	Z1+ Z1-
FCP TO BATTERY	BAT+ BAT-
POWER PANEL TO FCP AND RFAR	H N G
RELAY	K
STROBE	S1-* S1-*

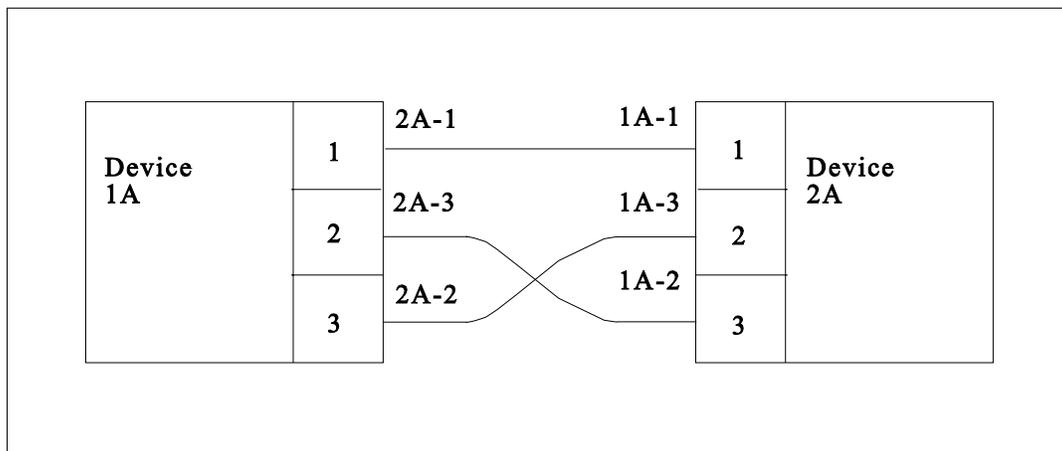
*Terminal Number.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

4. When wiring from device to device inside the same enclosure, the destination wiring method should be used. For example, near the terminal where the wire leaves the device, the wire should be labeled identifying its destination device and terminal.

Similarly, at the opposite end, the wire will have a different label identifying the destination device and terminal (see Figure A-1). Short jumpers between terminals on the same device do not require labels.

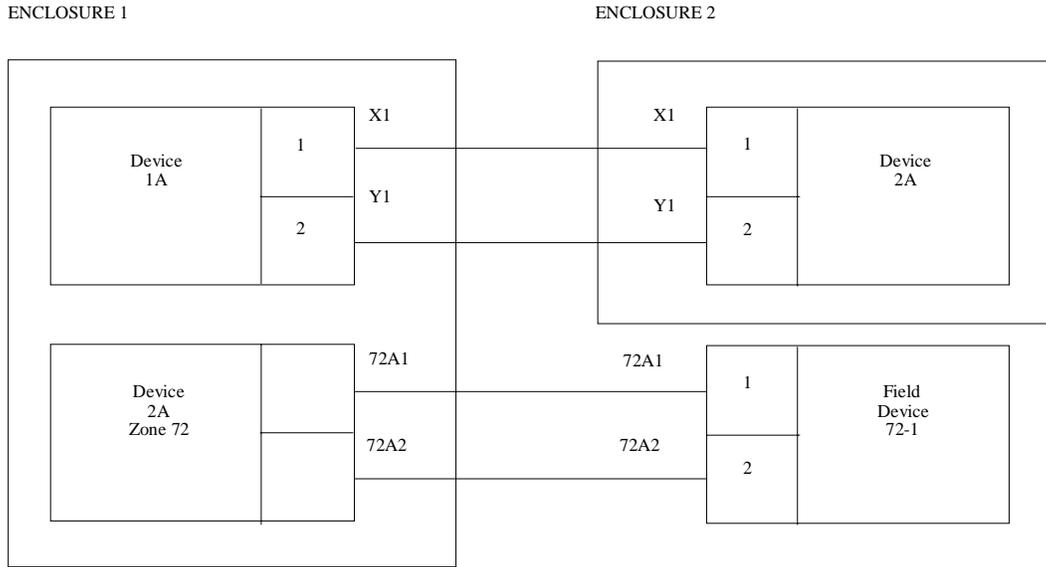
Figure A-1. Wire Labels Inside an Enclosure.



5. Device labeling and wire labeling between enclosures or field devices.
- Field devices are assigned an alphanumeric identifier, depending on the type of system involved. For conventional fire alarm systems, the alphanumeric identifier is assigned based on the zone the device is connected to and its position in the circuit. For example, the first device in circuit of zone 72 should be labeled 72-1, etc. For addressable fire alarm systems, the device is given an alphanumeric identifier corresponding to the device address assigned within the software of the microprocessor.
 - When wiring from one enclosure to another enclosure or field device, the same wire label should be maintained at both ends of the wire. The label should be unique from any other label used in the installation (see Figure A-2).

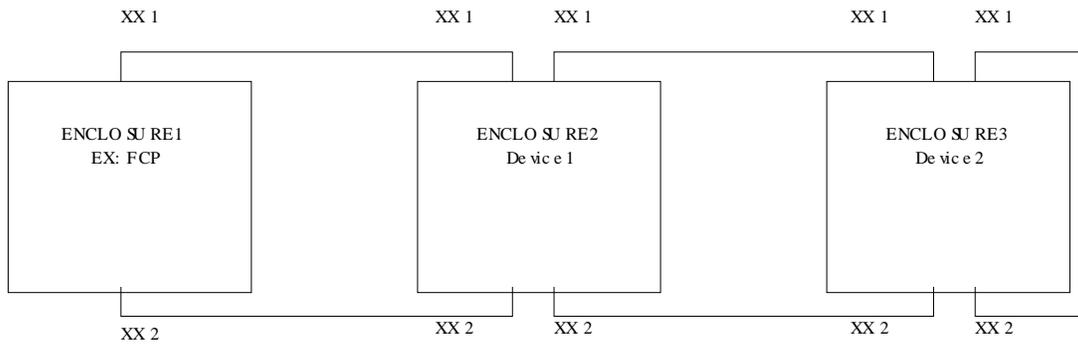
ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

Figure A-2. Wire Labels Between two Enclosures.



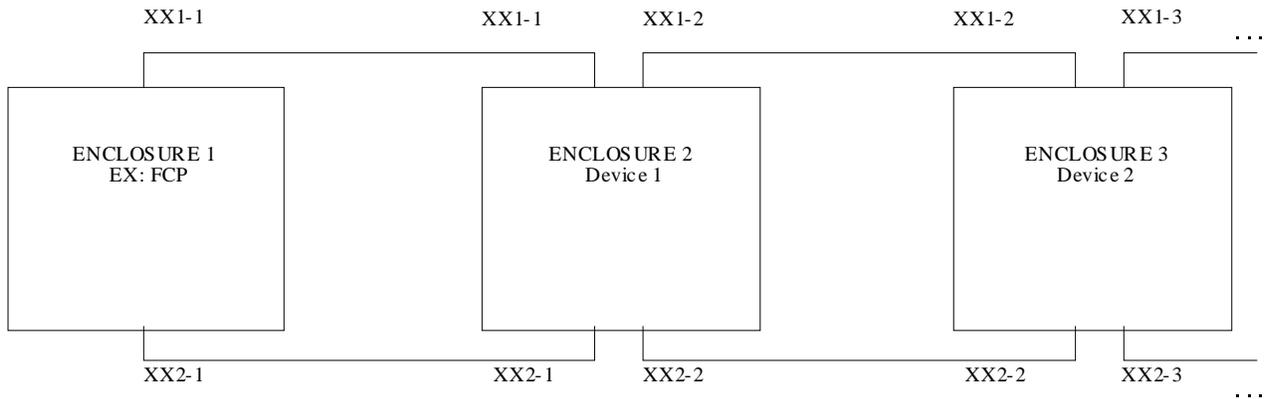
- c. The same wire label can be used more than once in zone and bell circuits. These circuits involve many devices connected in parallel to the same two wires. Each device is located in a separate enclosure; e.g., junction box (see Figure A-3).

Figure A-3. Wire Labels Between Zone and Bell Devices or Other Enclosures.



ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

- d. Devices with multiple terminals. When the terminals for the wires entering the device (e.g., detector, bell) are different than the terminals used for the wires leaving the device, an extension should be added to the wire label identifying where the wire is to be landed (see Figure A-4).

Figure A-4. Wire Labels Between Enclosures when Termination Points are Critical.**2.8 Radio Fire Alarm Reporting Boxes**

1. The municipal fire alarm boxes for the Hanford Site are radio fire alarm reporter boxes. The boxes are manufactured by the GH Harlow Company as approved by the Hanford Fire Department, and shall be procured for site projects through Lockheed Martin Services, Inc., Radio Maintenance.
2. Radio fire alarm reporter boxes can be used as a street-type, manually operated fire reporting system or as a directly connected, automatically operated auxiliary fire reporter system. The auxiliary type radio fire alarm reporter boxes can provide 8, 16, 24, 32, 40, and 48 zones for connection to a local fire alarm control panel.
3. The Hanford Fire Department assigns the radio fire alarm reporter box code numbers.
4. Radio fire alarm reporter boxes shall be grounded to the main building grounding electrodes (e.g., water pipe, building steel, grounding grid, etc.) in accordance with NFPA 70.
5. Before design has been completed, approval from the Hanford Fire Department and TFC Safety shall be obtained for installation of multiple fire alarm control panels reporting to a single radio fire alarm reporter box.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

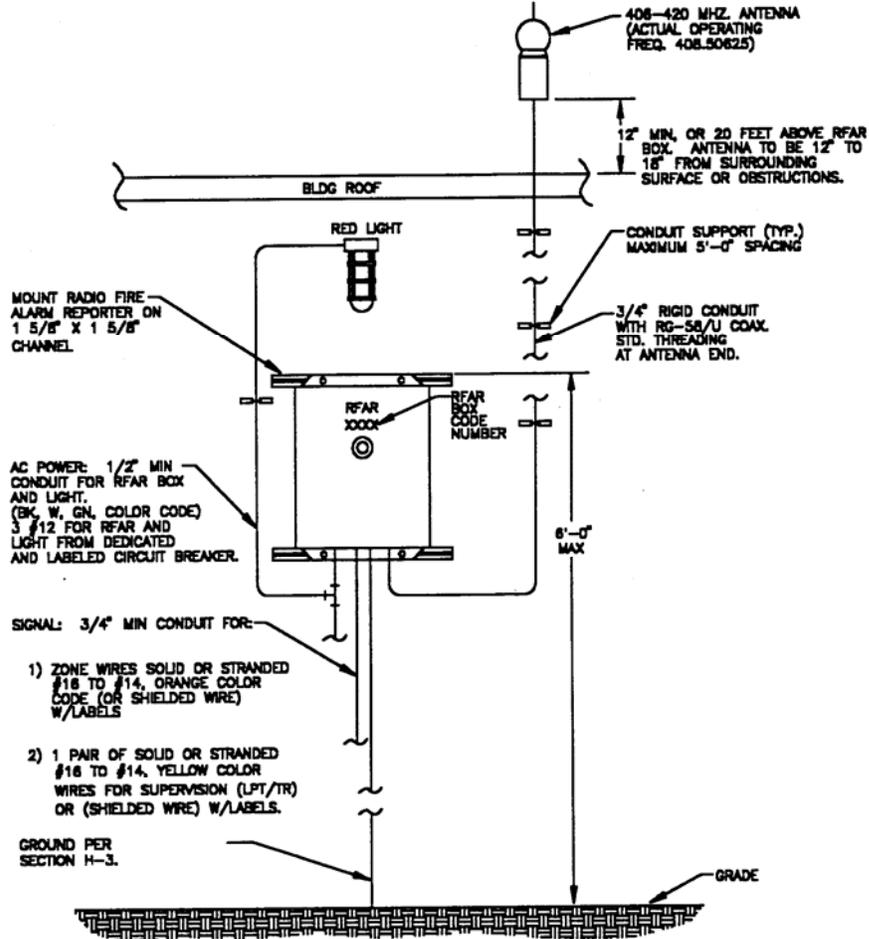
6. Radio fire alarm reporter antennas shall be procured for site projects through Radio Maintenance. The location of the radio fire alarm reporter box and antenna on the outside of buildings shall be as directed by Radio Maintenance. The conduit for the antenna shall be 19 mm (3/4-inch) rigid conduit.
7. Conduit entry into the radio fire alarm reporter box shall be completed with water tight connectors through the bottom of the box. Penetration shall be a maximum of 63.5 mm (2-1/2 inches) from the back of the radio fire alarm reporter box
8. Radio Maintenance shall complete final wiring connections inside the radio fire alarm reporter enclosure.
9. Radio fire alarm reporter box enclosures shall not be used as a junction box or wire pass-through for power or signaling circuits not related to the fire alarm reporting system.
10. Figure A-5 provides guidance for installation of radio fire alarm reporter boxes.

3.0 FIRE SUPPRESSION SYSTEMS**3.1 General**

1. Fire suppression systems shall be designed and constructed in accordance with the following, as applicable:
 - DOE O 420.1A, "Facility Safety"
 - NFPA 13, "Standard for the Installation of Sprinkler Systems"
 - 29 CFR 1910, "Occupational Health and Safety Standards"
 - 29 CFR 1926, "Safety and Health Regulations for Construction"
 - DOE -STD-1088-95, "Fire Protection for Relocatable Structures"
 - Underwriter's Laboratory Product Directories (including the periodic supplements)
 - Factory Mutual Research Corporation Approval Guide
 - WAC 173-303, "Hazardous Waste."
2. New installations and modifications or additions to existing systems shall be the manufacturer and type approved by TFC Safety.
3. Automatic sprinkler system drawings, underground fire main drawings, and the contractor's materials and test certificates that are produced by an off-site contractor are required to be stamped and signed by the holder of a current State of Washington Fire Sprinkler Level III Certificate of Competency.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

Figure A-5. Typical Radio Fire Alarm Reporter Box Installation.



NOTES:

1. ELECTRONICS PACKAGE TO BE INSTALLED AND TESTED BY RADIO MAINTENANCE DURING THE OPERATIONAL TEST.
2. INSTALL ALL CONDUIT WITH WATER TIGHT FITTINGS AT THE BOTTOM, WITHIN 2 1/2" FROM THE BACK OF THE RFAR BOX.
3. ALL CONDUITS AND ENTRY WAYS TO BE PLUGGED AND SEALED.
4. COORDINATE INSTALLATION AND LOCATION OF EXPANDER CABINET WITH RADIO MAINTENANCE WHEN MORE THAN 16 ZONES ARE REQUIRED.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

4. Fire protection components/equipment shall be listed for their intended use by Underwriter's Laboratories Inc., or approved by Factory Mutual Research Corporation, where applicable.
 - a. Dry system air compressors installed on dry systems under 567.8 l (150 gallon) capacity shall be listed or approved for use with sprinkler systems.
 - b. Trim valves and accessories of alarm check valves, dry pipe valves, deluge valves, etc., shall be approved or listed for intended use as part of the approved trim package as supplied by the manufacturer.
5. Drawings shall be approved by TFC Safety before installation begins.
6. As-built drawings must be approved and issued prior to final acceptance test procedure.

3.2 Sprinkler System Design

1. As a minimum, sprinkler systems shall be designed to NFPA 13 Ordinary Hazard Group 2 occupancy classification. The density may be higher, depending on the degree of hazard. If approved by TFC Safety a density lower than the Ordinary Hazard Group 2 occupancy classification may be used.
2. Sprinkler systems having air or other gases in the piping (dry pipe, pre-action) shall be designed using internally and externally galvanized piping. The TFC does not have any of these systems and requirements will be expanded if/when such a system is planned for installation.

3.3 Water Mist System Design

1. Water mist fire suppression systems are complex and all design calculations shall be performed by a competent engineer qualified designer.
2. Individual components or the pre-engineered system shall be listed by a nationally recognized testing laboratory.
3. As a minimum, requirement from NFPA 750, for design, installation, maintenance, and testing shall be met or exceeded.

3.4 Water Flow Test Data

1. Water flow test data is required for conceptual design reports and definitive design. The test data shall be included in the report or the design/installation package.
2. Water flow test data shall be requested from the Hanford Fire Department.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**3.5 Underground Water Lines Minimum Depth of Earth Cover**

All water mains used for fire protection water supplies shall have a minimum earth cover above top of pipe of 1066mm (42 inches).

3.6 Hydraulic Design

1. Hydraulically designed sprinkler systems shall have a flow and pressure factor that is a minimum of 10% below the water supply curve. The "C" factor of 120 shall be used in the hydraulic calculations.
2. Hydraulically calculated systems shall include a basic 31.5 l/s (500 gpm) outside hose stream allowance and any additional demand (e.g., additional hose stream, in-rack sprinklers, process water, etc.).
3. FM Loss Prevention Data Sheet 2-84 provides maximum velocity for sprinkler piping and must be followed. Avoid turbulent velocities in piping.

3.7 Alarm Check Valves

An alarm check valve is required on all new wet pipe sprinkler systems in permanent facilities that have 20 or more heads.

3.8 Water Flow Alarm Gongs

1. Mechanical Water Motor Gong
 - a. A water motor alarm gong shall be used except when the water disposal from the gong is not possible or for small systems (less than 20 heads) where an alarm check valve is not installed.
 - b. A drain pipe should be appropriately routed from the water motor gong terminating with a 45 degree elbow turned down. Provide a splash block where necessary to prevent erosion.
2. Electrical Water Flow Alarm
 - a. Water flow alarm pressure switches are preferred for dry pipe systems and wet pipe systems having alarm check valves.
 - b. Wet sprinkler systems designed without alarm check valves and mechanical water motor alarm gongs shall be equipped with electric non-silenceable water flow alarm bells. This bell shall be continuous ringing, mounted on the building exterior, 24 Vdc, and powered from the fire alarm control panel. The first pole of the flow alarm pressure switch shall be connected to the fire alarm control panel. The water flow bell shall be activated by the second pole of the water flow alarm pressure switch.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**3.9 Halon**

1. The TFC ~~has no Halon systems, does not currently have any active Halon systems~~ and no ~~n~~New Halon systems shall be installed.

4.0 GENERAL DESIGN AND DRAWING REQUIREMENTS

1. Drawings shall show, in graphic and quantitative form, the extent, location, relationship, and dimensions of the work to be done in sufficient detail to demonstrate that the design requirements have been met and to facilitate construction of the work.
2. Drawings shall be produced by AutoCad R14 format. Drawing files shall be on 3-1/2 inch computer diskettes or CDs, uncompressed.
3. Identify conduit and conductor sizes, and number of conductors in each conduit on the floor plan drawings. Provide each conductor and device with a unique alphanumeric identifier.
4. Interconnecting wiring in the fire alarm control panel and radio fire alarm reporter panels between modules, and connecting wiring to the field device terminals on point-to-point wiring diagrams.
5. Fire alarm control panel jumper cuts, switch positions, or other "programming" features shall be annotated on the drawing.
6. Attachment designs: Hanger and support details, fastener types, sizes, material to be fastened to and embedment depth shall be shown on the drawing.
7. Power supply, HVAC, and miscellaneous control circuit diagrams shall be shown on drawings, as applicable.
8. Drawings shall be prepared using Hanford title blocks and numbers.
9. Fire barrier penetration information shall be shown on drawings. The information shall include a sketch of the barrier penetration (i.e., UL configuration) and information on appropriate patching material used.

5.0 WATER SUPPLY AND DISTRIBUTION SYSTEM CRITERIA

1. Domestic water distribution systems that also serve fire protection requirements should be designed to satisfy the calculated Fire Hydrant Demand (see item 2) and the peak domestic demand. Where no other requirements are applicable, the peak domestic demand should be based on 2.5 times the calculated average daily demand plus any special demands, such as industrial or processes, that cannot be reduced during a fire. The distribution system should be capable of meeting this combined demand at a minimum residual pressure of 20 psi at ground elevation (or higher elevation if special conditions apply) for a period of not less than two hours. Municipal supplies having the same capability are acceptable.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

2. Fire Hydrant Demand. Where reliance is placed on fire department response, either for protection of unsprinklered buildings or where the fire department will serve as redundant (backup) protection, the water supply available from hydrants should be capable of providing the flow rates established in the Uniform Fire Code based on the most severe facility fire risk on site. These values may be reduced by a maximum of 50% when the facility is provided with automatic sprinkler protection throughout in accordance with the applicable NFPA standards.
3. Within a building or facility, domestic water should be supplied by a separate service line and not be a combined fire protection and potable water service or a combined process water and potable water system. Where combined fire and domestic-process water systems are used, distribution piping should be routed and provided with valves such that the domestic and process systems can be isolated without shutting off the fire system supply.

6.0 STRUCTURAL FIRE PROTECTION CRITERIA**6.1 General**

Any materials with unusual fire characteristics, such as urethane foams, and any materials that develop significant quantities of toxic or harmful products of combustion (as delineated in Material Safety Data Sheets and other sources of product information) should not be used as interior finishes or other interior applications without the approval of the authority having jurisdiction (AHJ). The use of foam plastics in construction should be prohibited unless it fully complies with Factory Mutual (FM) Data Sheet 1-57. Additional requirements for nuclear filter plenum fire protection are provided in DOE STD 1066-99.

6.2 Fire Barriers

1. Wall, floor and ceiling, and roof and ceiling assemblies should be tested and rated for their fire resistance by Underwriter's Laboratories (UL) or similar nationally recognized testing laboratories, or should be listed for their fire resistance as approved by FM or similar organizations.
2. Fire Resistance. The development of a fire hazards analysis (FHA) and a Documented Safety Analysis (DSA) should include consideration of conditions that may exist during normal operations and special situations (e.g., during periods of decontamination, renovation, modification, repair, and maintenance). Where required by the FHA or DSA, the structural shell surrounding critical areas and their supporting members should remain standing and continue to act as a confinement structure during anticipated fire conditions, including failure of any fire suppression system not designed as a safety class item. Fire resistance of this shell should be attained by an integral part of the structure (concrete slabs, walls, beams, and columns) and not by composite assembly (membrane fireproofing). In no event should the fire resistance rating be less than two hours under conditions of failure of any fire suppression system not designed as a safety class item. (Refer to NFPA Standard 221 and FM Data Sheet 1-22.)

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

3. Special facilities should be designed and constructed using building components of fire-resistant and non-combustible material, particularly in locations vital to the functioning of confinement systems. Combustible materials should not be used in the construction of process system confinement barriers.

6.3 Flame Spread

1. Exposed interior wall or ceilings (including ceilings formed by the underside of roofs), and any factory-installed facing material, should have a UL-listed/FM-approved flame spread rating of 25 or less and a smoke developed rating of 50 or less per ASTM E-84.
2. Duct work constructed of Fiberglass Reinforced Plastics (FRP) should be listed or approved for use without interior sprinklers, or should be provided with automatic sprinklers per the applicable FM data sheets.

6.4 Roofing Systems

1. Membrane roof systems should be constructed in accordance with the FM Loss Prevention data sheets.
2. Built-up bituminous membrane roofing on metal decks should comply with FM Class I.

6.5 Penetrations

1. Fire Barrier Penetration Seals. Fire barrier penetration seals should comply with NFPA 101, Chapter 6. Penetration seal materials and assemblies should be tested for their fire resistance and listed by UL or similar nationally recognized testing laboratories, or should be approved by FM. Where fire-rated assemblies (walls, floor-ceilings, roof-ceilings) are either partially or fully penetrated by pipes, ducts, conduits, raceways, or other such building elements, fire barrier penetration material should be placed in and around the penetrations to maintain the fire resistance rating of the assembly.
2. Where fire barriers are penetrated by the confinement system's ventilation ducting, fire dampers should be appropriately used to maintain the barrier integrity. However, the closure of such dampers should not compromise the functions of the confinement system where the loss of confinement might pose a greater threat than the spread of fire. In such cases, alternative fire protection means (e.g., duct wrapping, duct enclosure, or rerouting) should be used as a substitute for fire barrier closure. Sprinkler systems, such as those designed as a "water curtain," should not be considered a fire barrier substitute.

6.6 Carpets and Rugs

1. Carpets and rugs should be tested in accordance with NFPA 253 (ASTM E-648) when applying the floor finish requirements of the Life Safety Code (NFPA 101) to DOE facilities.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)

2. Carpets and rugs used in storage or industrial occupancies should have a critical radiant flux not less than the following:
 - 0.45 watts per square centimeter in areas unprotected by an automatic fire suppression system; and
 - 0.22 watts per square centimeter in areas protected by an automatic fire suppression system.

7.0 LIFE SAFETY CRITERIA

1. Life safety provisions should be provided for all facilities in accordance with NFPA Standard 101, "Life Safety Code" (LSC). The methods outlined in NFPA 101A, "Alternate Approaches to Life Safety," may be applied with judgment to all facilities to obtain an equivalent level of life safety where strict compliance with the LSC is not cost-effective. Compliance with the LSC is considered by DOE to satisfy the exit requirements of the applicable building code and 29 CFR 1910.
2. Any security, radiological control, or other physical restrictions to prevent access to, or egress from, an area should not prevent emergency egress in the event of a fire or related condition. Where conflicting criteria exist, the most effective compromise should be implemented consistent with the objectives of ORP M 420.1, as determined by the AHJ.
3. In addition to life and fire safety, the design of interior corridors should reflect the following:
 - Personnel traffic flow patterns
 - Movement of equipment (including initial equipment installations, facility operations and future replacement or removal), and
 - Ultimate decontamination and decommissioning of the facility, including equipment required during decontamination.
4. In those areas where an accidental breach of a primary confinement system could expose personnel to radioactive material, a distance of 75 feet, as measured by the method in NFPA 101, should be the maximum travel distance to ensure that personnel can exit through the next confinement.
5. Doors that serve as exits from security areas should comply with NFPA 101 and DOE security requirements. (Refer to the egress criteria for correctional occupancies for additional guidance.) When security-related hardware is installed on a fire door, the modifications should not adversely affect the fire rating of the door. Such modifications should be in accordance with door manufacturer's guidelines.

ATTACHMENT A - FIRE PROTECTION DESIGN CRITERIA (cont.)**7.1 Hazardous Areas**

1. When exemptions are granted to specific DOE fire protection standards for reasons unique to DOE facilities, as in the case of some containment structures, fire protection features should be provided so as to assure the life safety of facility occupants as required by the AHJ.
2. Hazardous areas, such as radioactive spaces or spaces with inert atmospheres, should have sufficient detection, alarms, and interlocks to assure that access by emergency personnel will not endanger such personnel or result in a public hazard.
3. Exit requirements for toxic and explosive environments should be as determined by the AHJ. In addition, for explosives environments, exits should reflect the criteria contained in the DOE Explosives Safety Manual (DOE M 440.1-1).