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**Title**
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<td>BH Johnson 6/27/18</td>
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DOE FIRE PROTECTION HANDBOOK -
HANFORD CHAPTER

Revised July 2018
Mission Support Alliance
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1.0 INTRODUCTION

New projects and facility design, construction, and modifications involving fire alarm systems, fire suppression systems, or water supplies at Hanford shall be in accordance with U. S. Department of Energy (DOE) Fire Protection Program requirements and all other applicable DOE Orders, Standards, and Directives.

The Hanford Chapter is developed and maintained by the Hanford Fire Marshal’s Office (HFMO) with consensus approval by the Hanford Fire Protection Forum (HFPF) prior to submittal to DOE.

The requirements of this chapter apply to all Hanford contractors that are contractually obligated to comply with CRD O 420.1C (Change and Supplement as specified by contract) or MGT-ENG-IP-05 R3, and HNF-52336, Rev. 0, Authority, Responsibilities, and Duties of the Hanford Fire Marshal (Hanford Fire Marshal’s Charter).

2.0 PURPOSE AND SCOPE

This procedure establishes the criteria necessary for the design, upgrade and modification of fire protection systems at Hanford facilities. This procedure applies to all new designs, upgrades, or modifications prepared for or by Hanford Contractors, its subcontractors, managed facilities, programs, projects, and activities. This procedure does not apply to structures that do not require fire protection systems specifically covered by this document. The revision of this document in effect at the time it is applied to a project shall be the Code of Record (COR) for that design and installation.

2.1 RETROACTIVITY

This procedure applies to all fire alarm and fire suppression systems designed, installed, upgraded or modified from this point forward. It is not generally intended to be applied retroactively to existing facilities and systems except that when existing facilities and systems are modified, it shall apply to the modified portion(s) of those facilities and systems. However, in the event that the Hanford Fire Marshal’s Office (HFMO) determines that a significant hazard exists that endangers building occupants, the public, or the environment, or that DOE’s programmatic fire protection requirements are not met, its requirements may be applied retroactively. All retroactive applications of this procedure shall be documented in writing and approved by the HFMO.
3.0 CODES AND STANDARDS

3.1 REGULATORY REQUIREMENTS

The following regulatory requirements apply to fire protection systems at Hanford, in addition to the requirements of this Chapter:

- CRD O 420.1C, Facility Safety (Change and Supplement as specified by contract)
- MGT-ENG-IP-05 R3, Fire Protection Program
- NFPA 1, Fire Code
- NFPA 13, Standard for the Installation of Sprinkler Systems
- NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection
- NFPA 22, Standard for Water Tanks for Private Fire Protection
- NFPA 24, Private Fire Service Mains and Their Appurtenances
- NFPA 70, National Electrical Code (NEC)
- NFPA 72, National Fire Alarm and Signaling Code
- NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems
- 29 CFR 1910, Occupational Health and Safety Standards
- 29 CFR 1926, Safety and Health Regulations for Construction
- DOE-STD-1066-2012, DOE Standard Fire Protection
- WAC 173-303, Dangerous Waste Regulations
- WAC 212-80, Fire Sprinkler System
- WAC 246-290, Public Water Supplies
- International Building Code (IBC)

3.2 CODE OF RECORD

Unless otherwise modified by contract between the Hanford contractor and DOE the Code of Record (COR) for a given facility, system and/or facility or design modification shall include the editions of the applicable national consensus Codes and Standards in effect when final design commences.

The criteria found in Appendix A—"Guidance for Classifying Modifications" shall be used for determining whether a modification to existing fire safety features (i.e., fire alarm and detection systems, fire sprinkler and suppression systems, and structural fire protection) constitutes a "modification of a substantial nature" according to CRD O 420.1C, Change 1 (Supplemented Rev. 0) Facility Safety or "major modification" according to MGT-ENG-IP-05 R3 Fire Protection Program.
3.3 LEGACY SYSTEMS, COMPONENTS, AND DEVICES

Existing (legacy) fire alarm and fire suppression systems are allowed to be maintained in service in accordance with the COR:

A. System components may be replaced in kind or with comparable products in current production under the original COR unless the HFMO determines that a significant hazard exists that endangers building occupants, the public, or the environment, or that DOE's programmatic fire protection requirements are not met. New system devices and components shall be approved/listed for the intended use.

B. Existing circuits, functions and device locations may be reduced or extended or modified as necessary to accommodate building changes, other than change of occupancy and/or hazard classification, provided that new components are listed for the application, are installed in accordance with the equipment manufacturer's published installation instructions and the applicable NFPA standard(s) and the modified system continues to provide protection adequate for the hazard(s). In some cases a deactivation analysis, in accordance with approved procedures, and HFMO approval may be required to effect the removal of all or portions of existing fire protection systems from service.

C. Replacement fire detectors shall provide comparable or increased sensitivity to smoke/heat as existing detectors as appropriate. If the replacement detectors are powered from their associated initiating device or signaling line circuit, they shall be specifically listed for use with the Fire Alarm Control Unit (FACU).

D. FACU's may be replaced in kind or with comparable, current production FACU's with the approval of the HFMO, pending confirmation of compatibility with existing detectors, wiring, environmental limitations and power demands. Where significant incompatibilities exist, the HFMO may require replacement of the affected fire alarm system in whole or in part.

E. Replacement sprinklers shall be the same type, temperature rating (±10°F), K-factor, and orifice size as the sprinklers they replace.

4.0 FIRE PROTECTION DESIGN REQUIREMENTS

The requirements of this section are applicable to all new fire protection related modifications, design, and installations on the Hanford Site.

4.1 ACCEPTABLE EQUIPMENT

New installations and modifications or additions to existing systems shall be by the manufacturer and type approved by the HFMO.

A. Fire protection system equipment, components, and devices shall be installed, tested, and maintained in accordance with the manufacturer's published instructions and this document.
B. Fire protection system equipment, components, and devices shall be listed for the purpose for which they are used.

C. Although it is recognized that there are numerous technologies and manufacturer’s available to meet Hanford’s fire protection needs, it is necessary to standardize in order to establish a consistent level of protection across the site and to control ancillary costs related to spare parts, training, certifications, procedures for inspection, testing, maintenance, troubleshooting and configuration control.

D. The HFMO shall maintain a list of preferred fire protection equipment for installation on the Hanford Site. The preferred equipment list shall be maintained in Appendix B of this document. The preferred equipment list shall be updated as needed to maintain options sufficient to address current and developing site and market conditions.

E. Any Hanford contractor may submit alternative products for inclusion in the preferred equipment list. Such submittals will be evaluated against current and anticipated future site needs by the Hanford contractor’s engineering organization and either accepted or rejected by the HFMO within 60 days.

F. For FACUs that are new to the site, the installing project shall provide:
   1. Copies of applicable as-built programming files
   2. Factory-certified software/programmer training for a minimum of two designated individuals in the Fire Systems Maintenance organization
   3. Factory-certified operations/troubleshooting training for technicians and firefighters.

4.2 GENERAL DESIGN AND DRAWING REQUIREMENTS

A. For new building construction or major modifications to any facility, the design documents shall include fire protection criteria based on either a Fire Protection Design Analysis (FPDA) or a Preliminary/Project Fire Hazard Analysis (PFHA), depending upon whether or not a building Fire Hazard Analysis (FHA) is normally required.

B. 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.

C. Drawings shall be produced by AutoCAD (latest edition) format. Drawing files shall be on CD/DVD, uncompressed. If nonstandard fonts are used, the font file must be supplied with the drawing file.

D. Drawings shall be prepared using Hanford Title Blocks. Generally, the standard size sheet used is 28 inches by 40 inches, size F.

E. Fire sprinkler and fire alarm system contractors shall comply with the certification and stamping requirements of 4.3.1 and 4.3.2 below.
F. Fire protection systems shall include the following documentation, review and approval as indicated:

1. An owner’s manual and manufacturer’s published instructions covering all system equipment.
2. For software-based fire alarm systems, a record copy of the facility-specific software.
3. For sprinkler systems, a record copy of the hydraulic calculations.
4. All fire protection design drawings, specifications, calculations and equipment/hardware submittals must be:
   - Approved by the appropriate system Design Authority within the Hanford contractor’s organization,
   - approved by a Qualified Fire Protection Engineer (QFPE) within the Hanford contractor’s organization, and
   - approved by a HFMO representative (i.e., Deputy Fire Marshal) prior to the start of installation as evidenced by the issuance of a Hanford Fire Marshal Permit.
5. All drawing plans, sections, and details shall be useable and readable when printed on an 11” x 17” sheet of paper. The Hanford contractor’s QFPE or HFMO representative has the authority to reject drawings deemed unusable or unreadable.
6. Upon successful completion of the acceptance test procedure (ATP); the system as-built drawings shall be revised as appropriate, walked down and approved by a designated representative of the Hanford Fire Marshal (HFM), and issued prior to system acceptance.

G. At least one (1) digital and one (1) hardcopy of all fire protection system documentation shall be delivered to the Hanford contractor’s Fire Protection Engineer, and either entered into the Hanford contractor’s document control system or the associated project file, as applicable.

4.2.1 FIRE SUPPRESSION SYSTEM DRAWINGS

A. Shop drawings, working plans, and submittals for automatic sprinkler system design and underground fire main design produced by an offsite contractor are required to be stamped and signed by the holder of a current State of Washington Fire Sprinkler Level 3 Certificate of Competency*.

* This Washington Administrative Code section is invoked relative to the requirements for certification and licensure of those contracting on the Hanford Site to design and/or install fire sprinkler systems including associated underground feed mains.
B. "As built" drawings for sprinkler systems and underground fire mains as well as contractor's Materials and Test Certificates shall be stamped and signed by a State Level 3 or State Level U certified individual (respectively) indicating compliant installation.

C. Fire suppression system design drawings and equipment/hardware submittals must be approved by a QFPE representing the Hanford contractor.

D. Drawings and submittals for water system additions and modifications shall be approved by a designated representative of the HFMO prior to installation.

E. As-built drawings shall be approved and issued prior to acceptance of the system from the contractor.

F. Water flow test data is required for conceptual design reports and definitive design. This data shall be included in the report or the design package that will have fire suppression systems installed. Waterflow test data shall be provided if requested from the HFMO.

4.2.2 FIRE ALARM SYSTEM DRAWINGS

Fire Alarm drawings for Hanford shall comply with the requirements of NFPA 72 Section 7.4 and NFPA 170 Chapter 8.

A. 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.

B. Interconnecting wiring internal to the Fire Alarm Control Unit (FACU) and Radio Fire Alarm Reporter (RFAR) panel enclosures, between components, and external connecting wiring to field device terminals on point-to-point wiring diagrams shall be shown on drawings.

C. FACU jumper cuts, switch positions, mapping, and other "programming" features shall be annotated on the drawings indicating system configuration. Hanger and support details, fastener types, sizes, material to be fastened to and embedment depth shall be shown on the drawings.

D. Power supply, HVAC and miscellaneous control circuit diagrams shall be shown on drawings as applicable.

4.3 PERSONNEL QUALIFICATIONS

4.3.1 FIRE SUPPRESSION SYSTEM CONTRACTORS

A. Offsite contractors performing installation of sprinkler system and underground fire mains shall be licensed fire protection contractors holding a State Level 3 (State Level U for underground only) license issued by the State of Washington.
4.3.2 FIRE ALARM SYSTEM CONTRACTORS

A. Designs provided by offsite contractor(s) shall be prepared by a Certification in Engineering Technologies (NICET) Level III/IV Fire Alarm Designer or a licensed professional Fire Protection Engineer. The design media shall bear the stamp and signature of this individual.

B. Fire alarm system installers and programmers shall be qualified or shall be supervised by persons who are qualified. Qualification shall include the following:

1. Factory training and certification for fire alarm system installation and programming of the specific type and brand of system being installed, or

2. National Institute for NICET Fire Alarm Systems Certification Level II (minimum)

3. All required training shall be documented.

C. Evidence of personnel qualifications shall be submitted and approved by the Hanford contractor’s Design Authority and/or Fire Protection Engineer before installation.

4.4 SYSTEM REQUIREMENTS

4.4.1 WATER SUPPLIES

A. Water mains used for fire protection water supplies shall have a minimum earth cover above top of pipe of 42 inches.

B. Underground water distribution mains shall be a minimum of 12 inches unless otherwise approved by the Hanford Fire Marshal’s Office.

C. Underground fire water distribution mains shall comply with NFPA 24.

D. Fire pumps shall comply with NFPA 20.

E. Fire water supply tanks shall comply with NFPA 22.

4.4.2 FIRE HYDRANTS

A. Fire hydrants shall be dry barrel compliant with AWWA C502, with compression type main valve that opens against pressure. Inlet valve shall have a minimum 5-inch opening. Hydrants shall have one 4½-inch pumper connection and two 2½-inch hose connections each with caps and chains. Connection threads shall be in accordance with NFPA 1963, National Hose threads. Hydrant operating nut and cap nuts shall be National Standard Pentagon and open in a counter-clockwise direction. Stem seals shall be O-ring type.

B. Hydrant shall be Clow Medallion, M & H Model 929, or equal approved by Fire System Maintenance and shall be painted chrome yellow. A typical Hanford hydrant detail is shown in Figure 1.
C. Baseline flow data shall be established and documented for all new hydrants. Contact the HFD for support in conducting flow tests.

4.4.3 FIRE SUPPRESSION SYSTEMS

A. Fire sprinkler systems shall comply with NFPA 13.

B. Fire suppression systems shall be designed to provide an actuation alarm through an approved fire alarm system to the HFD.
C. As a minimum, sprinkler systems shall be designed to NFPA 13 Ordinary Hazard Group 2 occupancy classification unless otherwise approved by the HFMO. The discharge density may be higher depending on the degree of hazard. When determining the occupancy classification, give consideration to expected future uses of the facility.

D. Sprinkler system water supply piping installed in unheated areas (e.g., crawl spaces) shall be provided with listed and supervised freeze protection and approved for use by the HFMO.

E. Sprinkler piping shall be schedule 40. Fittings shall be as permitted by NFPA 13 and shall be listed for the intended use.

   *Exception: Rolled grooved fittings shall not be used in a sprinkler system when the system is supplied directly from the discharge of a fire pump within the fire pump room. Use threaded, cut grooved, or welded/flanged fittings in such situations.*

F. Cast iron fittings shall not be used.

G. Check valves larger than 2 inches shall include a removable access cover to facilitate ease of inspection and maintenance.

H. When the building is seismically designed, the design of sway bracing for seismic supports of sprinkler piping shall meet site-specific acceleration criteria. These requirements may exceed the minimum seismic bracing requirements of NFPA 13.

I. All new sprinkler systems and extensions/modifications to hydraulically designed sprinkler systems shall be hydraulically designed.

J. Sprinkler systems shall be hydraulically designed so that the calculated flow and pressure, based on the water supply data used for design, are a minimum of 10 percent and 10 psi, respectively, below the available water supply.

K. Hydraulically calculated systems shall include a basic 250-gpm outside hose stream allowance and any additional hose stream allowances and other water demands that may be part of the requirements, such as in-rack sprinkler demand or other process demand.

L. All new dry pipe sprinkler systems shall be provided with means that allows the connection of a temporary air compressor in the event of a failure of the normal compressor and/or air maintenance device. The connection shall be on the system side of the air maintenance device and be equipped with its own valve.

M. New Halon systems shall not be installed.

### 4.4.3.1 FIRE DEPARTMENT CONNECTIONS

A. Freestanding Fire Department Connections (FDCs) are encouraged for new permanent structures. See Figure 2 for a suggested freestanding FDC detail.

B. Wall-mounted FDCs are acceptable for new relocatable structures.
C. Freestanding FDCs should be located outside of the building collapse zone, should facilitate ease of fire department access, and should avoid conflict with firefighting activities.

**Figure 2. Freestanding FDC Detail**

### 4.4.3.2 WATERFLOW ALARM GONGS

A. The drain pipe for a mechanical gong shall 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.

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, located in accordance with NFPA 13, 24 VDC and powered from the FACU via a supervised notification appliance circuit.
4.4.3.3 BACKFLOW PREVENTERS

A. Contact the MSA Water Purveyor to determine if a backflow prevention device is required to be installed in the water supply line feeding the sprinkler system. If a backflow preventer is required in the water supply line to the sprinkler system, it shall be a make and model approved for use by the State of Washington Department of Health. Per WAC 246-290, backflow prevention assemblies that appear on the USC-Approved Assemblies List (http://fccchr.usc.edu/list.html) are acceptable.

B. A factory test certification shall be provided with all backflow prevention assemblies.

C. Backflow preventers shall be forward flow tested after installation to ensure proper operation and that there are no obstructions.

4.4.3.4 LOW TEMPERATURE SWITCHES

A. Sprinkler system risers in mobile structures with aboveground crawlspace shall be equipped with UL listed temperature detectors with the sensor placed on the piping within the crawlspace. The piping shall be wound with UL approved heat tape covered by a layer of insulation.

B. Where a low temperature switch is provided, it shall be monitored by the fire alarm system (either the building fire alarm system or the sprinkler waterflow and supervisory system, as appropriate) as a supervisory signal.

4.4.3.5 CONTROL VALVE SUPERVISION

A. Sprinkler PIV's and control valves shall be locked open using a steel padlock with a breakaway shackle, approved by the HFMO, or electrically supervised in accordance with NFPA 13 unless an approved, supervised automatic sprinkler system is required by NFPA 101 or the building code, in which case the PIV and control valves shall be electrically supervised.

B. Sealing or tagging sprinkler system water supply control valves as a means of supervision shall be prohibited.

4.4.4 PORTABLE FIRE EXTINGUISHERS

A. The selection of portable fire extinguishers for a given situation shall be determined by company Fire Protection Engineers (FPE) utilizing the applicable requirements specified in NFPA 10.

B. Acquisition and disposal of fire extinguishers shall follow HFD-DI-EM-60942, *Acquiring/Disposing of Fire Extinguishers*
4.4.5 FIRE ALARM SYSTEMS

4.4.5.1 FIRE ALARM CONTROL UNITS

A. Future expansion capability shall be provided and addressed by design in accordance with the growth potential of the building.

B. Complete supervision of fire sprinkler systems shall include, but not be limited to, sprinkler control valves, low temperature switches (where provided), and air pressure supervision for dry pipe sprinkler systems in accordance with NFPA 13 and NFPA 72.

C. Compatibility of the FACU with the FARS must be verified. Equipment, components and devices shall be listed for the purpose for which they are to be used.

D. Bypass Switches

1. Building fire alarm systems shall be provided with a bypass switch or switches to disable audible and visual notification appliances and each type of fire safety control function (e.g., elevator recall, fan shutdown, suppression system releasing, etc.) during routine testing and maintenance.

2. Bypass switches are NOT required for dedicated function fire alarm systems.

3. Bypass switches shall be clearly labeled, two position switches.

4. All contacts shall be rated for the loads being switched.

5. Bypass switches shall be Double Pole-Double Throw (DPDT) switches.
   a. One set of contacts shall effect the required function by physically opening the associated supervised control or releasing circuit; causing both a trouble condition at the FACU and transmission of a trouble signal to the supervising station.
   b. For control or releasing circuits, the second contact on each bypass switch shall be monitored by the FACU as a supervisory signal.
   c. Engaging and disengaging a bypass switch will allow Hanford’s fire alarm maintenance personnel to confirm that it is the bypass switch which is causing the trouble signal and allow positive verification that the function has been bypassed.

6. Actuation of a bypass switch shall be annunciated at the associated fire alarm control panel and cause a supervisory condition to be transmitted to the supervising station.

7. Bypass switches shall be key-operated or located within a locked cabinet or arranged to provide equivalent protection against unauthorized use.
4.4.5.2 FACU LOCATION

A. Where an FACU is required by NFPA 72, it shall be installed in a convenient location near the building's main entrance and shall be readily accessible and visible to responding firefighters.

1. Where the FACU is not at or near the main entrance, a remote annunciator with system control (i.e., signal acknowledge, signal silence, system reset) capability shall be located at or near the main entrance.

B. Locations for all FACUs, RFAR Boxes, and Remote Annunciators are subject to the approval of the HFMO and those locations shall be approved prior to installation.

4.4.5.3 FIRE ALARM WIRING

A. Fire alarm wiring shall comply with the requirements of NFPA 72, Article 760 of NFPA 70, and DOE-STD-1066-2012. As a minimum, all pathways should be designed to criteria for Pathway Survivability Level 1, unless an FHA or other appropriate design documentation indicates that a higher survivability level is required.

- Signaling Line Circuits (SLCs) that provide communication between local FACUs and a main or master fire alarm control station or between networked FACUs shall be designated and designed according to Pathway Class A or Class X.

- SLCs that provide communication between addressable devices, appliances, and control panels shall be designed according to Pathway Class A, B, or X criteria as determined by an FHA or other appropriate design documentation.

- Initiating Device Circuits (IDCs) that connect initiating devices, such as detectors, monitor modules and manual pull stations shall be designed, as a minimum, to meet the requirements of Pathway Class B.

- Notification Appliance Circuits (NACs) shall be designed, as a minimum, to meet the requirements of Pathway Class B.

B. Notification Appliance Circuits (NACs) that connect notification appliances with an FACU

C. The ground point for shielded conductors shall be in the FACU.

D. Junction box covers associated with fire alarm systems shall be identified by decals or red paint.

E. Signaling conductors between the FACU and FARS equipment, components, and devices shall be separated from other conductors to ensure that electromagnetic interference is eliminated.

F. All new fire alarm conductors shall be installed using non-power limited conductors and wiring methods.

G. Wire nuts shall not be used and splices of any kind shall be minimized. When point-to-point wiring is not practical, splices shall be made in junction
boxes using pressure-type solderless connections or pressure plate type terminal blocks. Connectors shall be installed according to the manufacturer's instructions and with the proper tool and torque setting for the connector or terminal.

H. Terminations of stranded conductors shall be made using crimp on terminal lugs. Connections to pressure-plate type terminal blocks are approved without the use of lugs.

I. All conductors shall be of a size acceptable per the NEC for the associated load; Conductors shall be no smaller than No. 16 American Wire Gauge (AWG) for single conductors and no smaller than No. 18 AWG for multi-conductor cables. Single conductors size No. 14 AWG and larger shall have THHN/THWN insulation.

4.4.5.4 DEVICE AND WIRING LABELS

A. The following examples in Table 1 are given 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.

1. 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 1.

<table>
<thead>
<tr>
<th>Type of Circuit</th>
<th>Alphanumeric Identifier</th>
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<tbody>
<tr>
<td>BELL/GONG/CHIME</td>
<td>G1A</td>
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<td></td>
<td>G1B</td>
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<td>1A2</td>
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<td>S1B</td>
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</table>
2. Device and Wire Labels Inside an Enclosure.
   
   a. Generally, device-to-device conductors within a single enclosure are not required to be individually labeled. However, complexity of design may warrant labeling and shall be provided by the installer at the direction of the Hanford fire Marshal’s Office.

   b. Devices within enclosures are assigned an alphanumeric identifier dependent on their location within the enclosure. If the device to be labeled is located in Row 1, Column A, then the device typically is labeled Device 1A. Device 1A is usually located in the upper left-hand corner of the enclosure.

   c. 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 3. Short jumpers between terminals on the same device do not require labels.

   ![Figure 3. Wire Labels Inside an Enclosure.](image)

3. Device labeling and wire labeling between field enclosures or field devices.
   
   a. 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.

   b. Labels on field devices shall match those corresponding identifiers on the record drawings.

   c. When wiring from one enclosure to another enclosure or field device, the same wire label shall be maintained at both ends of the wire. The label shall be unique from any other label used in the installation (see Figure 4).
d. 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 5).

e. 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 6).
B. Relays, switches, push-buttons, terminals, terminal boards, etc., in the FACU shall be marked and identified, and properly coordinated with the nomenclature on the drawings.

### 4.4.5.5 MANUAL PULL STATIONS

Manual fire alarm boxes (pull stations) shall be non-break Glass, double action type.

### 4.4.5.6 POWER SUPPLIES

A. The primary power source for fire alarm system equipment, components, and devices shall be a dedicated branch circuit from the commercial light and power panel. The typical Fire Alarm Control Unit (FACU) AC power requirement is 120 VAC/20A/60 Hz. Other requirements for the primary power are:

1. The FACU and FARS fire alarm system equipment, components, and devices shall not receive power from the same circuit.

2. The dedicated branch circuit and connections shall be mechanically protected (conduit).

3. Each means of circuit disconnect (e.g., breaker) shall have a red marking and fitted with a suitable guard requiring manual removal before the breaker can be operated.

4. Circuit disconnect means shall be accessible only to authorized personnel (breaker blocking device connected with the breaker in the ON position).

5. Each circuit disconnect means shall be identified as “FIRE ALARM CIRCUIT”, “FACU”, “RFAR”, etc.

6. The location of the circuit disconnecting means shall be permanently identified at the FACU.

B. Design load connected to fire alarm power supplies and standby batteries shall not exceed 80% of rated capacity.

C. Standby batteries and battery chargers shall be sized to accommodate 125% of the connected load.
D. Voltages above 50 volts are not permitted within the FACU except for the FACU power leads which shall be protected from personnel exposure.

4.4.5.7 OTHER REQUIREMENTS

Fire alarm controls shall be housed in key-locked control cabinets. Locks furnished with this equipment shall be Corbin Cabinet Lock, Key Cat. No. 60.

4.4.6 FIRE ALARM REPORTING SYSTEM

A. The Fire Alarm Reporting System shall be as described and specified in MSA-ENG-61186, Proprietary Supervising Station System Criteria for Fire Alarm Reporting Systems.

4.4.7 FIRE ALARM SYSTEM COMMISSIONING

All fire alarm system installations, upgrades and modifications shall be commissioned in accordance with the requirements of this Section and NFPA 72.

A. The installer (installation contractor) shall:

1. Complete the Record of Completion (ROC) documentation as mandated by NFPA 72;
2. Complete the installation and sign the ROC in the space provided;
3. Perform an operational test with the support of Hanford organizations as needed (e.g., Radio Services, Hanford Fire Department (HFD), etc.) and sign the ROC in the space provided;
4. Submit the ROC to the HFMO with a written statement that the system has been installed in accordance with approved drawings and plans, and tested in accordance with the manufacturer’s published instructions and appropriate NFPA and DOE requirements; and
5. Upon completion of acceptance testing, ensure that the ROC is provided to the design contractor, or system designer.

B. The design contractor, or system designer, shall:

1. Prepare the acceptance test procedure (ATP). An ATP shall be written for each new, modified or upgraded fire alarm system;
2. Ensure that the ATP addresses all components and functions as required by approved design drawings, specifications, and submittals;
3. Ensure that the ATP includes adequate functional testing of all new, upgraded modified, and affected components and devices to ensure that they operate as intended by NFPA 72; and
4. Ensure that the ATP is reviewed and approved, as a minimum, by the designer, the Hanford contractor’s fire alarm system design authority (DA), and by a designated representative of the HFMO (i.e., the contractor’s Deputy Fire Marshal).
5. Upon completion of acceptance testing, ensure that:
   - The completed ROC is included in the appropriate project files and a copy provided to the facility system/design engineer; and
   - The completed ATP is submitted to the Hanford Document Control System or to the appropriate project file, and a copy provided to the facility system/design engineer.

C. The installer shall conduct acceptance testing in accordance with the ATP:
   1. As a prerequisite to performing the ATP, the installer(s) shall sign-off on the ATP stating that operational testing in accordance with the ROC has been successfully completed;
   2. All fire alarm system components shall be functionally tested to ensure they operate as intended in accordance with NFPA 72;
   3. The ATP shall be performed by the system installer(s) and supported by the Hanford Site Radio Services organization and the Hanford Fire Department (HFD).
   4. The following personnel shall witness the ATP and acknowledge satisfactory completion of testing on both the ATP and on the ROC:
      - A representative from each installing contractor
      - A testing contractor representative
      - A representative from the affected property
      - A designated representative of the HFMO (AHJ)

D. The facility system/design engineer shall:
   1. Maintain a current copy of ROC(s) applicable to the facility fire alarm system, updated to reflect system additions or modifications, stored at the facility; and
   2. Maintain a copy of completed ATPs applicable to the facility fire alarm system.
Appendix A- Guidance for Classifying Modifications
A.1 Purpose

The following criteria shall be used for determining whether a modification to existing fire safety features (i.e., fire alarm and detection systems, fire sprinkler and suppression systems, and structural fire protection) constitutes a "modification of a substantial nature" according to CRD O 420.1C, Change 1 (Supplemented Rev. 0) Facility Safety or "major modification" according to MGT-ENG-IP-05 R3 Fire Protection Program.

A.2 Criteria

This criteria is based on "Repairs", "Classification of Work Compliance Method", and "Change of Occupancy" as found in the International Existing Building Code (IEBC), 2018 Edition.

A work area is defined by the IEBC as:

"That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code."

A.3 Summary Table

The following Table offers a summary of the type of modification (substantial or major) as determined by the IEBC Categories described below.

<table>
<thead>
<tr>
<th>IEBC Category</th>
<th>Not Substantial or Major Modification</th>
<th>Substantial or Major Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairs</td>
<td>X</td>
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</tr>
<tr>
<td>Level 1 Alterations</td>
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<td></td>
</tr>
<tr>
<td>Level 2 Alterations</td>
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<td>X</td>
</tr>
<tr>
<td>Level 3 Alterations</td>
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</tr>
<tr>
<td>Additions</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Change of Occupancy</td>
<td>X*</td>
<td>X**</td>
</tr>
</tbody>
</table>

*Level 1 Alterations, e.g., deactivation of fire safety features

**Level 2 or 3 Alterations, e.g., reconfiguration, extension, or addition of fire safety features
A.4 IEBC Categories

**Repairs** include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements. Repairs are done in a manner that maintains the level of fire protection provided (i.e., level of fire protection is in accordance with the original approved level of fire protection per the Code of Record).

A repair is not a "modification of a substantial nature" or a "major modification".

Examples include:

- The replacement or repair of a fire alarm control unit or transmitting equipment with "like-for-like" equipment, devices or appliances, or other new equipment using a graded approach, that meets the minimum requirements of the Code of Record; or

- The replacement or repair of fire rated construction (e.g., fire barriers, fire proofing, fire rated penetration seals, etc.) with "like-for-like" fire rated construction that meets the minimum requirements of the Code of Record.

**A Level 1 Alteration** includes the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose. Under these conditions, alterations are completed in a manner that maintains the level of fire safety provided (i.e., level of fire safety is in accordance with the original approved level of fire safety per the Code of Record).

A level 1 alteration is not a "modification of a substantial nature" or a "major modification".

Examples include:

- The replacement of a fire alarm control unit or transmitting equipment with new equipment that meets the minimum requirements of the Code of Record; or

- The replacement or modification of fire rated construction (e.g., fire barriers, fire proofing, fire rated penetration seals, etc.) with new fire rated construction that meets the minimum requirements of the Code of Record.

A Level 1 Alteration does not preclude a prudent decision to replace an old, unreliable, obsolete, fire safety system with a new system that meets all applicable current Codes and Standards. In such cases, a new Code of Record is established.
Level 2 and Level 3 Alterations, and Additions include the reconfiguration or addition of space, the addition or elimination of doors or windows, the reconfiguration or extension of any system, or the installation of any additional equipment.

Level 2 and Level 3 alterations differ by the extent of the work area in relation to the existing building area. The work area for a Level 2 Alteration involves less than or equal to 50% of the area of the existing building area, where the work area for a Level 3 Alteration involves a work area that is in excess of 50% of the area of the existing building.

Additions include new construction that increases the height and/or area of an existing building.

In all cases involving Level 2 and Level 3 Alterations and Additions, modification, reconfiguration or installation of life safety features (i.e., the configuration, characteristics, and support features for means of egress) shall be evaluated according to, and comply with, the requirements for rehabilitation found in the most current edition of NFPA 101®, Life Safety Code® in lieu of the IEBC.

For Level 2 and Level 3 Alterations and Additions, all new construction elements, components, systems, and spaces in the work area that involve fire protection features are required to be completed in compliance with the current edition of the International Building Code (IBC) and the current edition of other applicable Codes and Standards.

Any alteration or addition that causes an existing fire safety feature located outside of the work area to become non-compliant with its Code of Record shall require that the affected fire safety feature be brought into compliance with the current edition of the IBC and current edition of applicable Codes and Standards.

A Level 2 or Level 3 Alteration or Addition is a “modification of a substantial nature” and a “major modification”.

Examples include:

- The installation of additional, or reconfiguration of, fire protection features (e.g., fire alarm system equipment, devices, appliances, system wiring, etc.) within the work area, or the extension of existing fire protection features from outside of the work area into the work area.

- The reconfiguration or extension of a fire alarm control unit or transmitting equipment that does not meet the minimum requirements of the Code of Record established for the Hanford Site proprietary supervising station alarm system (i.e., the Code of Record for Hanford’s proprietary supervision station alarm system is NFPA 72, 2013 Edition); or

- The reconfiguration or extension of a building fire alarm system, which meets the minimum requirements of the Code of Record, with a dedicated function fire alarm system that is not addressed by the Code of Record (note that a dedicated function fire alarm system first appeared in the 2007 Edition of NFPA 72, and that an approved deactivation analysis is also required for this type of modification); or
• The modification of fire rated construction (e.g., fire barriers, fire proofing, fire rated penetration seals, etc.) that cannot meet the minimum requirements of the Code of Record.

Change of Occupancy provisions apply where there is a change in the occupancy classification or a change in use within an occupancy classification of a building, or where there is a change in the occupancy classification or use of a portion of a building.

All changes to the classification or use of an occupancy in a building affecting life safety features shall be evaluated according to, and comply with, the requirements for rehabilitation found in the most current edition of NFPA 101®, Life Safety Code® in lieu of the IEBC.

For all areas of a building affected by a change of occupancy, where alterations to existing fire protection features are required, the alterations shall be installed in accordance with the current edition of the IBC and the current edition of other applicable Codes and Standards.

Any change of occupancy that causes an existing fire safety feature located outside of the area affected by the change to become non-compliant with its Code of Record shall require that the affected fire safety feature be brought into compliance with the current edition of the IBC and current edition of other applicable Codes and Standards.

A Level 2 or Level 3 Alteration resulting from a Change of Occupancy is a “modification of a substantial nature” and a “major modification”.

Deactivation and removal of fire protection features, if appropriate, due to a change in occupancy shall follow existing Hanford Site processes for deactivation of fire protection systems.

A Level 1 Alteration that removes fire protection features due to a Change of Occupancy is not a “modification of a substantial nature” or a “major modification.”
Appendix B- Hanford Site Preferred Equipment List
B.1 Introduction

In order to simplify training, spare parts, maintenance and operation of Fire Protection systems standardization of equipment should be maintained. This list is developed and maintained by the Hanford Fire Marshal’s Office (HFMO). Any deviations from the preferred equipment shall be approved by the HFMO.

B.2 Purpose and Scope

This document provides the preferred list of fire protection equipment, devices, and appliances for use on the Hanford Site.

B.3 Preferred Equipment List

Hanford Site Fire Protection Preferred Equipment List

B.3.1 Fire Suppression Systems

- Tyco fire protection products

B.3.2 Fire Alarm Systems

B.3.2.1 Fire Alarm Control Units (FACUs)

B.3.2.1.1 Conventional FACUs

- FIRE-LITE MS-10UD-7
- FIRE-LITE MS-5UD-3

B.3.2.1.2 Addressable FACUs

- FIRE-LITE ES-50X
- FIRE-LITE ES-200X

B.3.2.2 Initiating Devices

- ADDRESSABLE DEVICES LISTED WITH THEIR FACU

B.3.2.2.1 Smoke Detectors

- SYSTEM SENSOR 2151
- SYSTEM SENSOR D2 (DUCT)

B.3.2.2.2 Manual Pull Station

- FIRE-LITE BG-12
Hanford Site Fire Protection Preferred Equipment List

B.3.2.3 Heat Detectors
- SYSTEM SENSOR 5151

B.3.2.3 Notification Appliances
- SYSTEM SENSOR P2RL/PC2RL (HORN/STROBE)
- SYSTEM SENSOR SRL/SCRL (STROBE)
- HONEYWELL HPFF8 (NAC EXPANDER)

B.3.2.4 Accessories/Peripherals
- FIRE-LITE ANN-80 (ANNUNCIATOR)
- STI SS2003ZA-EN (BYPASS SWITCH)

B.3.2.5 Radio Fire Alarm Reporter (RFAR)
- Monaco Enterprises BT-X

B.3.3 Obsolete Equipment

Obsolete equipment, devices and appliances may continue to be used in accordance with Paragraph 3.3, “LEGACY SYSTEMS, COMPONENTS, AND DEVICES”.

Repair or replacement of legacy equipment, devices and appliances with new equipment, devices and appliances that cannot be completed in a manner that maintains the original approved level of fire protection per the COR shall require compliance with the current edition of applicable Codes and Standards and the establishment of a new COR.