

1.0 PURPOSE AND SCOPE

(5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.5, 5.1.6, 5.1.7)

This standard implements the fire protection, design criteria requirements in accordance with ENS-ENG-IP-05 R0, “ORP Fire Protection Program;” DOE-STD-1066-99, “Fire Protection Design Criteria;” and HNF-36174, “DOE Fire Protection Handbook – Hanford Chapter.” This Standard also implements DOE-STD-1088-95, “Fire Protection for Relocatable Structures.” These requirements encompass all Tank Operations Contractor (TOC), its subcontractors, managed facilities, programs, projects, and activities involving new designs, upgrades, and modifications to facilities, HVAC systems, HEPA systems, roofing, fire protection barriers, and fire protection systems.

The Hanford Fire Marshal’s Office functions as the “building official’s office” for the approval of requirements for construction/modification, design packages, issuing construction, occupancy, and fire protection system permits. This function is similar to that performed by a state fire marshal’s office in that it deals with non-structural elements of the building codes and fire codes.

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 TOC facilities or fire protection systems are responsible for:

1. Ensuring that the applicable requirements of this standard are incorporated into their project/documentation.
2. Ensuring that TOC Safety & Health is consulted on fire protection systems, HVAC and HEPA system upgrades/installations, facility construction, and roofing issues and is involved in the review/approval process.
3. Ensuring that a Design Requirements Compliance Matrix (DRCM) is issued for new fire protection systems specifying Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) per TFC-PLN-98 if designated by the Chief Engineer.

3.2 TOC Safety & Health

1. TOC Safety & Health is responsible for maintaining a staff of qualified fire protection engineers (FPE) for assisting in the implementation of this standard.

NOTE: A qualified fire protection engineer is a graduate of an accredited university or college with a B.S. Degree in an engineering or a related technical field and meets the qualifications for Member Grade in the Society of Fire Protection Engineers (SFPE), or an engineer that has a Professional Member grade in the SFPE, or an engineer that is a Registered Professional Fire Protection Engineer. ORP qualified fire protection engineers must also meet the DOE fire protection engineering functional area qualification standard.

- TOC Safety & Health 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 standard.

NOTE: The TOC FPEs are deputized Hanford Fire Marshals.

3.3 Hanford Fire Marshal’s Office

The Hanford Fire Marshal’s Office functions as the “building official’s office” in the approval of requirements for construction/modification design packages and issuing construction, occupancy, and fire protection system permits. This function is similar to that performed by a state fire marshal’s office in that it deals with non-structural elements of the building codes and fire codes. The Hanford Fire Marshal has the authority to designate qualified Fire Protection Engineers as Deputy Fire Marshals (DFM). Pursuant to the authority granted to the Hanford Fire Marshal by DOE, all DFM shall function to uphold the authority, responsibilities, and duties of the Hanford Fire Marshal as contained in the Fire Marshal’s Charter. TOC personnel appointed as DFM by the Fire Marshal shall also meet criteria identified in TFC-PLN-13 and complete the Fire Protection Engineering Qualification Card (350883).

4.0 STANDARD

ITEM	REQUIREMENT	SOURCE
1	Fire protection program requirements shall be documented and incorporated in plans and specifications for new facilities and significant modifications to existing facilities. Documented review of plans, specifications, procedures, and acceptance tests by a qualified fire protection engineer in accordance with TFC-ENG-DESIGN-C-25, “Technical Document Control.”	DOE O 420.1B
2	The criteria and guidance in this standard shall be considered and incorporated, as appropriate, in the preparation of statements of work in accordance with TFC-ENG-DESIGN-D-13.2, “Guidance for Applying Engineering Codes and Standards to WRPS Statements of Work.”	TFC-ENG-DESIGN-D-13.2
3.	Installation or modification designs for all fire protection systems, water distribution systems, and life safety features as defined in NFPA 101, “Life Safety Code,” shall be approved and permitted by the Hanford Fire Marshal’s Office prior to installation or modification in accordance with TFC-ESHQ-FP-STD-01, “Fire Marshal Permits, Combustible Controls, and Construction/Occupancy Requirements.”	NFPA 1; 1.12 TFC-ESHQ-FP-STD-01
4.	The fire protection related codes and standards in effect when facility final design commences (code of record) shall remain in effect for the life of the facility unless: <ul style="list-style-type: none"> A significant hazard is identified as endangering the building occupants, the public, or the environment. 	ENS-ENG-IP-05 R0

ITEM	REQUIREMENT	SOURCE
	<ul style="list-style-type: none"> • Substantial upgrades or modifications are made to the building and/or fire protection systems. • A change in occupancy occurs. <p>In these cases, the facility shall be upgraded to the current requirements of the applicable code or standard (which becomes the code of record). When completed, each design, upgrade, installation, and modification shall be maintained in accordance with the new code of record.</p>	
5.	<p>Complete automatic fire suppression system per NFPA standards are required in all structures having a maximum possible fire loss (MPFL) (defined by DOE-STD-1066-99) in excess of \$3 million, when required by a NFPA standard, or when the International Building Code (IBC) requires it for construction height, allowable square footage size, construction type or occupancy classification. When the MPFL exceeds \$50 million a redundant fire protection system (defined by DOE-STD-1066-99) is required. When the MPFL exceeds \$150 million, a redundant fire protection system plus engineered fire barriers are required to limit the MPFL to \$150 million. Application of this requirement to existing facilities that have a short life shall be applied on a case-by-case basis utilizing the fire hazard analysis process.</p> <p>Fire protection systems design, installation, and acceptance testing shall comply with the required codes and standards of the NFPA and HNF-36174, "DOE Fire Protection Handbook, Hanford Chapter."</p>	ENS-ENG-IP-05 R0
6.	<p>All fire protection designs shall use equipment tested for its intended use and listed or approved by a nationally recognized testing laboratory (as defined by 29 CFR Section 1910.159 and 1910.165)</p> <p>NOTE: The fire protection engineer may issue 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.</p>	29 CFR 1910.159 -165 HNF-36174
7.	<p>Design authorities define the Quality Level of fire systems through an evaluation of both safety and project risk. Unless specified otherwise, fire systems maintenance shall provide Quality Level 0 services as defined in TFC-ESHQ-Q_ADM-C-01, "Graded Quality Assurance."</p>	Fire Marshal's Charter
8.	<p>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.</p>	Fire Marshal's Charter HNF-36174 ENS-ENG-IP-05 R0 DOE-STD-1066-99

ITEM	REQUIREMENT	SOURCE
9.	<p>Written acceptance test or operational test procedures shall be prepared and executed for all new fire system installations and/or modifications in accordance with TFC-ENG-DESIGN-C-18, "Testing Practices," as applicable, to verify the systems perform as required. Test procedures shall list all inspection, tests, analyses, and acceptance criteria. Any deficiencies noted during the tests shall be documented and tracked until resolved or corrected.</p> <p>Fire alarm system acceptance test plans shall be developed using the template approved by the Hanford Fire Department.</p>	NFPA 1; 13.1 TFC-PLN-98
10.	Acceptance test procedures required for all new fire system installations and/or modifications shall be reviewed and approved by TOC Fire Protection and the Hanford Fire Marshal's Office prior to execution.	Fire Marshal's Charter
11.	When fire alarm systems are installed in facilities on the Hanford Site, they shall be compatible with and connected to the Hanford Fire Department alarm monitoring/reporting equipment.	NFPA 72; 4.4.4.2.1 HNF-36174
12.	Documents for new designs and modifications to existing facilities affecting fire protection or fire code compliance shall be reviewed and approved by TOC Fire Protection and the Hanford Fire Marshal's (HFM) Office.	Fire Marshal's Charter NFPA 1; 1.1.1(3)
13.	Aspects related to fire protection shall comply with the most recent edition of the applicable NFPA Code or Standard.	ENS-ENG-IP-05 R0
14.	New project and facility design, construction and modifications shall comply with DOE-STD-1066-99, Fire Protection Design Criteria. All references to the word "should" in DOE-STD-1066-99 will be interpreted as a "shall".	DOE O 420.1B ENS-ENG-IP-05 R0 DOE-STD-1066-99
15.	<p>New facilities and facility modifications must conform to the fire resistance requirements, allowable floor area, building height limitations, and building separations of the IBC. Consistent with the Contractor's Requirements Document (CRD), the provisions of the IBC takes precedence over NFPA 5000, Building Construction and Safety Code. Building construction related to egress and life safety shall comply with the National Fire Protection Association (NFPA) 101®, Life Safety Code®. Conflicts between the IBC and NFPA 101® related to fire resistance rating shall conform to NFPA 101®. Compliance with the Life Safety Code® shall be considered to satisfy the exit requirements of OSHA 29 CFR 1910.</p> <p>a. Typically the International Fire Code (IFC) is a companion document to the IBC. However, for DOE operations, the IFC shall only be applied when the generation, treatment, storage, and disposal of ignitable and reactive wastes, defined in DANGEROUS WASTE REGULATIONS, WAC 173-303, is required by the Tri-Party Agreement. The NFPA 1, Uniform Fire Code, takes precedence over the IFC in all other situations. Other requirements of IFC are not considered criteria but may be used as a guide when established criteria do not address a specific situation.</p>	DOE O 420.1B ENS-ENG-IP-05 R0 29 CFR 1910, Preamble

ITEM	REQUIREMENT	SOURCE
16.	Noncombustible construction materials shall be used for facilities exceeding the size limitation established by DOE (DOE-STD-1066-99)	DOE O 420.1B ENS-ENG-IP-05 R0 DOE-STD-1066-99
17.	Interior finish materials (decorations, furnishings, and exposed wall or insulating materials) shall have an Underwriters Laboratories (ASTM E 84/NFPA 255) flame spread rating of 25 or less, and smoke-developed rating of 50 or less, except acoustical materials shall have a smoke-developed rating of 100 or less.	ENS-ENG-IP-05 R0
18.	Floor covering material shall have a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E 648/NFPA 253.	ENS-ENG-IP-05 R0
19.	<p>Wood used in a nuclear facility shall be pressure-treated fire retardant material with an Underwriters Laboratories (UL) classification of Fire Retardant (FR-S). Individual unlabeled pieces of wood (e.g., from a bundle or made by cutting larger pieces) shall be marked FR-S.</p> <p>a. Ordinary wood, other than scaffolding, may be coated with a clear or colored fire retardant paint/coating to satisfy the fire retardant requirement.</p> <p>b. Wood scaffolding shall be coated with a CLEAR fire retardant coating to satisfy the OSHA requirement that the boards are to be visible for inspection.</p> <p>c. The fire retardant coating shall be applied in accordance with the manufacturer's instructions.</p> <p>d. Noticeable degradation or damage to coating shall be repaired and coating reapplied.</p> <p>Use of wood products and materials in Category 2 or 3 Nuclear Facilities shall apply the As-Low-As-Reasonably-Achievable (ALARA) principle. Noncombustible materials shall be utilized whenever available and do not impact structural integrity.</p>	NFPA 801
20.	Automatic fire extinguishing systems throughout all significant facilities and in all facilities and areas with potential for loss of safety class systems, significant life safety hazards, unacceptable program interruption, or fire loss potential in excess of limits defined by DOE (ENS-ENG-IP-05 R0)	DOE O 420.1B ENS-ENG-IP-05 R0
21.	A reliable and adequate water supply for fire suppression shall be ensured during design and after construction.	DOE O 420.1B ENS-ENG-IP-05 R0
22.	Water distribution mains, either sanitary or raw water, that are being extended to supply water for domestic and/or process water and will provide water for fire suppression systems (sprinklers and/or hydrants), shall be at least 12 inches in diameter. Sectional valves shall be installed in the following manner for new installations and water distribution main upgrades.	DOE O 420.1B ENS-ENG-IP-05 R0

ITEM	REQUIREMENT	SOURCE
23.	<p>Multiple sectional isolation valves shall be provided at each intersection between a supply source and a main loop (one valve for each leg).</p> <ol style="list-style-type: none"> 1. Sectional valves shall be installed in accordance with a point system, such that no more than six points accumulate between sectional valves. The points for this arrangement are: one point for a fire hydrant, and two points for an automatic sprinkler system. 2. For new buildings, each building fire sprinkler riser shall be served by an independent underground water supply connection controlled by a supervised indicating control valve. Multiple system risers supplied by a single supply riser manifold are prohibited. A wet pipe system shall be permitted to supply an auxiliary (secondary) dry pipe, preaction, or deluge system, provided the water supply is adequate (i.e., computer room, loading dock, freezer, etc). 3. Water supplies for fire protection shall be of the looped grid type, providing two independent points of supply and two-way flow with sectional valving arranged to provide alternate water flow paths from the source to any point in the distribution system, where MPFL exceeds \$3 million. Application of this requirement to facilities that are existing will be made on a case-by-case basis after consultation with the ORP Authority Having Jurisdiction (AHJ) and Contracting Officer. 4. A minimum of two operational fire hydrants shall be provided for each building where parts of the exterior of the building shall be reached by hose lays of not over 350 feet with consideration given to accessibility and obstructions. Application of this requirement to facilities that exist will be made on a case-by-case basis after consultation with the ORP AHJ and the Hanford Fire Department. For new construction, at least one hydrant shall be located within 150 feet of fire department connections. Hydrants shall be of the standard type used at Hanford. 	DOE O 420.1B ENS-ENG-IP-05 R0
24.	<p>Fire flows shall be available for a period of at least two hours. A minimum four-hour supply shall be provided for large buildings, buildings with special public or physical hazards, multiple building sites, or groups of combustible buildings. For combined systems serving fire protection and other water demands (domestic and/or process), the supply and its distribution system shall be adequately sized to serve the combined peak flow for all uses. When storage tanks are used for combined service water and fire protection water, dedicated tank(s) or other physical means, such as a vertical standpipe, shall assure the minimum volume for fire uses.</p>	DOE O 420.1B ENS-ENG-IP-05 R0
25.	<p>Relocatable structures, defined by DOE-STD-1088-95, Fire Protection for Relocatable Structures, shall comply with DOE-STD-1088-95 and other applicable requirements of ENS-ENG-IP-05 R0. All references to the word "should" in DOE-STD-1088-95 will be interpreted as a "shall."</p>	ENS-ENG-IP-05 R0 DOE-STD-1088-95

ITEM	REQUIREMENT	SOURCE
26.	<p>The remaining applicable fire protection requirements in DOE O 420.1B and ENS-ENG-IP-05 R0 not specifically identified in this document in addition to the orders, codes and guide identified below shall also be followed for all fire protection designs, modifications, upgrades, and other fire protection related activities. If there is a conflict between the requirements, the most restrictive must be applied.</p> <ul style="list-style-type: none"> • 29 CFR 1910 • Part 29 CFR 1926 • 10 CFR 851 • International Building Code • DOE G 420.1-3, "Implementation Guide for DOE Fire Protection and Emergency Services Programs" • WAC 173-303, "Washington Administrative Code Dangerous Waste Regulations" • HNF-36174, "DOE Fire Protection Handbook – Hanford Chapter" • DOE-STD-1066-99, "Fire Protection Design Criteria" • DOE-STD-1088-95, "Fire Protection for Relocatable Structures." 	ENS-ENG-IP-05 R0
27.	HEPA Filter Bank design, modification, and installation shall incorporate appropriate requirements in accordance with DOE-STD-1066-99.	DOE-STD-1066-99
28.	HVAC systems shall be designed in accordance with the appropriate NFPA Code. (NFPA 90A; NFPA 90B)	ENS-ENG-IP-05 R0
29.	Glovebox construction shall be in accordance with DOE-STD-1066-99.	DOE-STD-1066-99
30.	<p>General. Fire protection for DOE facilities, sites, activities, design, and construction must—</p> <p>(1) provide a level of safety sufficient to fulfill requirements for highly protected risk (HPR).</p> <p>(2) prevent loss of safety functions and safety systems as determined by safety analysis and provide defense-in-depth, and</p>	DOE O 420.1B

ITEM	REQUIREMENT	SOURCE
	<p>(3) meet or exceed applicable building codes for the region and NFPA codes and standards as follows:</p> <p>(a) Facilities or modifications thereto must be constructed to meet codes and standards in effect, when design criteria are approved, otherwise known as the Code of Record (COR).</p> <p>(b) Provisions of subsequent editions of codes or standards (promulgated after the COR) must be met to the extent that they are explicitly stated to be applicable to existing facilities. Other provisions of updated codes and standards must be applied to existing facilities when a construction modification takes place or when a potential for immediate risk to life safety or health has been identified through either the facility assessment or fire hazards analysis (FHA) review process, or during the construction review or permitting process.</p> <p>(c) If applicable, ensure assumptions of combustible loading in the facility FHA are protected or update FHA for anything falling outside the analyzed criteria.</p>	
	<p>(d) Complete fire-rated construction and barriers, commensurate with the applicable codes and fire hazards, to isolate hazardous areas and minimize fire spread and loss potential consistent with limits as defined by DOE (See DOE-STD-1066-99).</p> <p>(e) Automatic fire extinguishing systems throughout all significant facilities and in all facilities and areas with potential for loss of safety class systems (other than fire protection systems), significant life safety hazards, unacceptable program interruption, fire loss potential in excess of limits defined by DOE, or when the IBC requires it for construction height, allowable square footage size, construction type or occupancy classification (See ENS-ENG-IP-05 R0 and DOE-STD-1066-99).</p> <p>(f) Redundant fire protection systems in areas where—</p> <p>(1) safety class systems are vulnerable to fire damage, and no redundant safety capability exists outside of the fire area of interest or</p> <p>(2) The maximum possible fire loss (MPFL) exceeds limits established by DOE.</p> <p>(3) In new facilities, redundant safety class systems (other than fire protection systems) must be located in separate fire areas.</p> <p>(4) A means (e.g., fire alarm or signaling system) to notify emergency responders and building occupants of a fire.</p>	

ITEM	REQUIREMENT	SOURCE
	<p>(5) Emergency egress and illumination for safe facility evacuation in the event of fire as required by applicable codes or fire hazards analysis.</p> <p>(6) Physical access and appropriate equipment that is accessible for effective fire department intervention (e.g., interior standpipe systems in multi-story or large, complex facilities).</p> <p>(7) A means to prevent the accidental release of significant quantities of contaminated products of combustion and fire fighting water to the environment, such as ventilation control and filter systems, and curbs and dikes. Such features would only be necessary if required by the FHA or DSA in conjunction with other facility or site environmental protection measures.</p> <p>(8) A means to address fire and related hazards that are unique to DOE and not addressed by industry codes and standards. Mitigation features may consist of isolation, segregation, or use of special fire control systems (water mist, clean agent, or other special suppression systems) as determined by the FHA.</p> <p>(9) Fire protection systems designed such that their inadvertent operation, inactivation, or failure of structural stability will not result in the loss of vital safety functions or inoperability of safety class systems as determined by the DSA.</p>	

5.0 SOURCES

5.1 Requirements

1. 29 CFR 1910.159, "Automatic Sprinkler Systems."
2. 29 CFR 1910.165, "Employee Alarm Systems."
3. DOE O 420.1B, "Facility Safety."
4. ENS-ENG-IP-05 R0, "ORP Fire Protection Program."
5. DOE-STD-1066-99, "Fire Protection Design Criteria."
6. DOE-STD-1088-95, "Fire Protection for Relocatable Structures."
7. 10 CFR 851, "Worker Safety and Health."

5.2 References

1. Correspondence No. 1204651, Contract No. DE-AC06-09RL14728 – "Recommended Revisions to the Charter for the Hanford Fire Marshal and Charter for the Hanford Fire Protection Forum."

**FIRE PROTECTION DESIGN
CRITERIA**

2. NFPA 1, "Fire Code."
3. NFPA 13, "Standard for the Installation of Sprinkler Systems."
4. NFPA 70®, "National Electrical Code®."
5. NFPA 72®, "National Fire Alarm Code®."
6. NFPA 101®, "Life Safety Code®."
7. NFPA 801, "Fire Protection for Facilities Handling Radioactive Materials."
8. HNF-36174, "DOE Fire Protection Handbook – Hanford Chapter."
9. "International Building Code."
10. TFC-ENG-DESIGN-C-18, "Testing Practices."
11. TFC-ENG-DESIGN-D-13.2, "Guidance for Applying Engineering Codes and Standards to WRPS Statements of Work."
12. TFC-ESHQ-Q_ADM-C-01, "Graded Quality Assurance."
13. TFC-PLN-98, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Program Plan."