Ownership matrix	**RPP-27195**

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1.0 PURPOSE AND SCOPE

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

This standard implements the fire protection design criteria requirements in accordance with MGT-ENG-IP-05, "Office of River Protection Fire Protection Program"; DOE-STD-1066-2012, "Fire Protection Design Criteria"; and HNF-36174, "DOE Fire Protection Handbook – Hanford Chapter." These requirements encompass all Tank Operations Contractor (TOC), its subcontractors, managed facilities, programs, projects, and activities involving new designs, upgrades, and modifications to facilities; heating, ventilation, and air conditioning (HVAC) systems; high-efficiency particulate air (HEPA) systems; roofing; fire protection barriers; egress systems; and fire protection systems.

Relocatable structures, defined by DOE-STD-1066-2012, must comply with DOE-STD-1066-2012, Appendix C, and other applicable requirements specified by MGT-ENG-IP-05.

Fire protection criteria, delineated in the codes and standards specified in DOE O 420.1C, "Facility Safety," and MGT-ENG-IP-05, are the minimum requirements for implementation of the U.S. Department of Energy, Office of River Protection (ORP) Fire Protection Program. Where conflicts in the application of required codes and standards arise, the more restrictive requirements apply, or an interpretation request may be made to the ORP authority having jurisdiction (AHJ). Interpretations shall be developed by or under direct supervision of a qualified TOC fire protection engineer (FPE).

The Hanford Fire Marshal's Office functions as the "building official's office" for the approval of requirements for construction/modification, design packages, and 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 nonstructural elements of the building codes and fire codes.

2.0 IMPLEMENTATION

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

3.0 STANDARD

The following applies to all TOC personnel and subcontractor activities, and to facilities owned or leased by the TOC, as appropriate.

3.1 Responsibilities

3.1.1 Project/Document Managers

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

- Ensuring that the applicable requirements of this standard are incorporated into their project/documentation
- Ensuring that a qualified TOC FPE 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

- Ensuring that a design requirements compliance matrix is issued for new fire protection systems specifying inspections, tests, analyses, and acceptance criteria in accordance with TFC-PLN-98, if designated by the chief engineer.

3.1.2 TOC Fire Protection Engineers

A qualified FPE is a graduate of an accredited university or college with a bachelor of science 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 FPEs must also meet the DOE fire protection engineering functional area qualification standard as defined by the TOC qualification card for FPEs (350883).

TOC Environment, Safety, Health & Quality is responsible for maintaining a staff of qualified FPEs for assisting in the implementation of this standard.

The TOC FPEs should qualify as deputized Hanford fire marshals in accordance with HFD-PRO-PPP-60658, "Deputy Fire Marshal Qualification."

- TOC deputized FPEs shall operate in the roles of building code official and fire code official (as described inMGT-ENG-IP-05) for Tank Farms and supporting operations.

- Qualified TOC FPEs 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.

3.1.3 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 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 nonstructural elements of the building codes and fire codes.
The Hanford Fire Marshal has the authority to designate qualified FPEs as deputy fire marshals (DFM) in accordance with HFD-PRO-PPP-60658.

Pursuant to the authority granted to the Hanford Fire Marshal by DOE, all DFMs shall function to uphold the authority, responsibilities, and duties of the Hanford Fire Marshal as contained in the Fire Marshal's Charter (HNF-52336, "Authority, Responsibilities, and Duties of the Hanford Fire Marshal"). TOC FPEs appointed as DFMs by the Hanford Fire Marshal shall also meet criteria identified in TFC-PLN-13 and complete the TOC qualification card for FPEs (350883).

3.2 Fire Protection Program Requirements, Codes, and Standards

Item	Requirement	Source
1.	Construction plans, drawings, and specifications for new designs and modifications to existing facilities affecting life safety systems, fire protection systems, facility access, water supplies, processes, hazardous materials, and other fire and life safety issues shall be reviewed and approved by a qualified TOC FPE prior to beginning construction activities. A qualified TOC FPE shall be consulted to ensure fire protection concerns are adequately addressed, that designs and modifications comply with the applicable requirements, and applicable permits are obtained.	Fire Marshal's Charter NFPA 1, section 1.1.1(3) WRPS-2001731
2.	Fire protection design analyses should be performed to ensure that fire protection program requirements are documented and incorporated into plans and specifications for new buildings and significant modifications to existing buildings. Perform fire protection design analyses as required in TFC-ESHQ-FP-STD-06.	DOE-STD-1066-2012, Section 7.1.2.1 TFC-ESHQ-FP-STD-06
3.	For Hazard Category 1, 2, and 3 nuclear facilities, or facilities valued over $150 million, the fire protection design review should be documented in a preliminary or project fire hazards analysis (FHA) that can be incorporated into the building FHA after project completion. Prepare this preliminary/project FHA as required in TFC-ESHQ-FP-STD-06.	DOE-STD-1066-2012, Section 7.1.2.2 TFC-ESHQ-FP-STD-06
4.	**International Building Code.** New facilities and major facility modifications must conform to the fire resistance requirements, allowable floor area, building height limitations, and building separations of the International Building Code (IBC). The provisions of the IBC take precedence over NFPA 5000, "Building Construction and Safety Code."	
	a. 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 WAC 173-303, "Dangerous Waste Regulations," is required by the Tri-Party Agreement (see TFC-ESHQ-FP-STD-13). The NFPA 1, "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.	29 CFR 1910, Preamble DOE O 420.1C DOE-STD-1066-2012 MGT-ENG-IP-05 R3

Item	Requirement	Source
	b. Performance of administrative functions of the building code should be documented by the contractor as required by other DOE orders and not by the administration chapter of the IBC.	
	c. The special industrial occupancy exception in the IBC for height and area limits is not appropriate for, and may not be applied to, Hazard Category 1, 2, and 3 nuclear facilities.	
5.	NFPA 101 shall be used in lieu of IBC, Chapter 10. **Life Safety Code.** Building construction related to egress and life safety shall comply with NFPA 101, "Life Safety Code." Conflicts between the IBC and NFPA 101 related to fire resistance rating shall conform to NFPA 101. For design of stairs, ramps, landings, guardrails, or handrails, see Attachments A, B, and C of this procedure. For access and egress safety relating to non-occupied conex boxes and similar structures, 29 CFR 1910, "Occupational Safety and Health Standards," or 29 CFR 1926, "Safety and Health Regulations for Construction," are applied as described in TFC-ESHQ-S-STD-05. WRPS Industrial Safety for assistance can be consulted for assistance.	DOE O 420.1C DOE-STD-1066-2012 MGT-ENG-IP-05
6.	**Compliance with the Occupational Safety and Health Administration (OSHA)**. Compliance with the IBC and/or NFPA 101 shall be considered to satisfy the exit requirements of 29 CFR 1910.	MGT-ENG-IP-05 29 CFR 1910, Preamble
7.	**Occupancy Classification.** The occupancy classification shall be determined at the beginning of design for all new buildings and structures. If the function/use of a building changes for any reason, the occupancy classification shall be evaluated and changed as required. Occupancy classification shall be determined for each building using the definitions in IBC and NFPA 101. These occupancy classifications shall be identified on the occupancy permit issued for that new building or structure.	IBC, Chapter 3 NFPA 101, Chapter 6

Item	Requirement	Source
8.	Operational aspects related to fire protection shall comply with the most recent edition of the applicable National Fire Protection Association (NFPA) code, NFPA standard, and DOE fire protection standard (DOE-STD-1066-2012). The fire protection-related design codes and standards in effect when facility final design commences (code of record [COR]) remain in effect for the life of the facility (e.g., if earlier version of DOE-STD-1066 was used in the design of the facility, then that version of DOE-STD-1066 applies to the design). When major modifications occur, as determined by the AHJ, the current edition of the code or standard shall apply to the modification. Exception: If there is a significant hazard that endangers building occupants, the public, or the environment as determined by the AHJ, the facility shall be upgraded to the requirements of the current edition of the code or standard	MGT-ENG-IP-05
9.	New project and facility design, construction, and modifications shall comply with design requirements contained in DOE-STD-1066-2012. All statements utilizing the word "should" in DOE-STD-1066-2012 are not considered mandatory but recommended guidance that must be considered. New relocatable structures, defined by DOE-STD-1066-2012, shall comply with DOE-STD-1066-2012, Appendix C and other applicable requirements specified by DOE-STD-1066-2012. All references to the word "should" in DOE-STD-1066-2012, Appendix C will be interpreted as a "shall."	DOE-STD-1066-2012 DOE O 420.1C MGT-ENG-IP-05
10.	All performance-based design alternatives to any code requirement should use the methodology described in the Society of Fire Protection Engineers (SFPE), SFPE Engineering Guide to Performance-Based Fire Protection, 2nd Edition, available through http://www.sfpe.org/, or other methodologies approved by the AHJ.	DOE-STD-1066-2012
11.	**Conflicting Code Requirements**. Conflicts between national codes and standards and DOE-specific safety or security requirements should be resolved by alternate designs that remove the conflict while assuring that an equivalent level of fire protection is maintained. Conflicts between NFPA requirements and the applicable building code requirements shall be resolved by consultation with designated building code and fire protection subject matter experts.	DOE-STD-1066-2012

Item	Requirement	Source
12.	**Code of Record**. Technical provisions of subsequent editions of codes or standards (promulgated after the COR) are mandatory only to the extent that they are explicitly stated to be applicable to existing facilities. Operational provisions of the most recent codes and standards (promulgated after the COR) should be evaluated and implemented to the extent practicable.	DOE-STD-1066-2012
13.	**Facilities Handling Radioactive Materials**. NFPA 801, "Fire Protection for Facilities Handling Radioactive Materials," is the applicable NFPA standard for the design and construction of Hazard Category 2 and 3 nuclear facilities. NFPA standards for nuclear reactors are the appropriate NFPA standards, as applicable, for design and construction of Hazard Category 1 nuclear facilities.	DOE-STD-1066-2012
14.	**Hazardous Materials**. NFPA 1 and NFPA 400, "Hazardous Materials Code," are the applicable NFPA standards for hazardous materials management plans within the Fire Protection Program. These plans should be supplemented with FM Global Property Loss Prevention Section 7 Data Sheets, as applicable.	DOE-STD-1066-2012
15.	**Highly Protected Risk.** Provide a level of safety sufficient to fulfill requirements for highly protected risk.	DOE O 420.1C DOE-STD-1066-2012
16.	**Lightning Protection**. NFPA 780, "Standard for the Installation of Lightning Protection Systems," is the applicable NFPA standard for lightning protection. NFPA 780 describes how to determine the need for lightning protection and how to install and maintain lightning protection when required (see also DOE-STD-1020-2012, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities," for additional information on lightning protection).	DOE-STD-1066-2012
17.	**Transformers**. Transformers installed inside buildings shall be of a dry type, with no combustible dielectric fluids. Outside transformers shall be located and protected in accordance with FM Global Property Loss Prevention Data Sheet 5-4, "Transformers."	DOE-STD-1066-2012
18.	**Combustible Mists and Vapors**. Processes that create or have the potential to create combustible mist and vapors as determined by the FHA shall be designed to monitor for accumulations of vapors and alarm at 25 percent of the lower flammability limit and shall be designed to control the accumulation of combustible residues in adjacent areas and ductwork.	DOE-STD-1066-2012

3.3 Construction Materials and Details

Item	Requirement	Source
1.	**Structural Materials.** New facilities (non-relocatable) exceeding 5,000 ft^2 of floor area shall be of Type I or Type II construction, as defined in the applicable building codes. Structural materials shall be noncombustible.	DOE O 420.1C DOE-STD-1066-2012
2.	**Nuclear Facilities**. Buildings that comprise Hazard Category 1, 2, and 3 nuclear facilities shall be of Type I or Type II construction.	DOE-STD-1066-2012
3.	Hazard Category 1, 2, and 3 nuclear facilities shall be classified as Group H-4 (high hazard) occupancies, as defined by the IBC, unless modified by the AHJ. If sufficient levels of other hazards exist, an alternate classification of Group H occupancy should be used.	DOE-STD-1066-2012
4.	Noncombustible construction materials shall be used for facilities exceeding the size limitation established by DOE.	DOE-STD-1066-2012
5.	**Roof Covering**. Roof coverings shall be Class A per ASTM E108, Standard Test Methods for Fire Tests of Roof Coverings," or UL 790, "Standard Test Methods for Fire Tests of Roof Coverings." Metal deck roof systems shall meet the requirements of Class I construction as defined in FM Global Property Loss Prevention Data Sheets 1-28R, "Roof Systems," and 1-31, "Metal Roof Systems."	DOE-STD-1066-2012
6.	**Interior Finish**. Nuclear facilities and laboratories shall have interior finish materials (decorations, furnishings, and exposed wall or insulating materials) with an Underwriters Laboratories (UL) (ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials," and NFPA 255, "Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components") 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.	MGT-ENG-IP-05
7.	**Floor covering**. 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, "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source" and NFPA 253, "Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."	MGT-ENG-IP-05
8.	Wood used in a nuclear facility shall be pressure-treated fire retardant material with a UL classification of Fire Retardant	NFPA 801

Item	Requirement	Source
	(FR-S). Individual unlabeled pieces of wood (e.g., from a bundle or made by cutting larger pieces) shall be marked FR-S.	
	a. Ordinary wood, other than scaffolding, may be coated with a clear or colored fire retardant paint/coating to satisfy the fire retardant requirement.	
	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.	
	c. The fire retardant coating shall be applied in accordance with the manufacturer's instructions.	
	d. Noticeable degradation or damage to coating shall be repaired and coating reapplied.	
	e. Use of wood products and materials in Hazard 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.	
9.	**Fire Barriers.** Fire barriers shall be designed, installed, and maintained as required by DOE O 420.1C, DOE-STD-1066-2012, MGT-ENG-IP-05, NFPA 101, IBC, or the facility FHA.	
	a. Designs for new buildings and designs for modifications to existing buildings shall be reviewed and approved by a qualified TOC FPE.	
	b. Fire barrier designs shall meet approved designs. Refer to the Underwriter's Laboratory Fire Resistance Directory, the Gypsum Association Fire Resistance Design Manual, IBC, or other sources approved by a qualified TOC FPE.	DOE O 420.1C DOE-STD-1066-2012 MGT-ENG-IP-05
	c. All modifications or additions that affect new or existing fire barriers shall be reviewed and approved by a qualified TOC FPE prior to construction.	
	d. Fire or smoke dampers shall be held open only with approved operating devices.	
	e. Fire doors shall not be chocked or blocked open. Fire doors that are normally in the closed position may be held open if continuously attended by a fire watch or alternate compensatory measures are in place and approved by a qualified TOC FPE.	
	f. Some fire doors are specifically designed to be held open with automatic closing devices (e.g., fusible	

Item	Requirement	Source
	links, smoke detector hold-open magnets). Keep these areas clear to allow the door to close.	
	g. The locations and boundaries of all fire barriers within a building shall be identified on drawings.	
	h. Fire doors and fire/smoke dampers should also be identified in the field to help facilitate testing and maintenance.	
	i. Fire doors/windows shall meet the requirements in NFPA 80, "Standard for Fire Doors and Other Opening Protectives".	
	j. Informational signs may be attached to fire doors. • The area of these signs shall not exceed five percent of the door face area. • The signs shall not obstruct any windows on the doors. • The signs shall be attached with an adhesive. • The signs shall not be nailed, screwed, or tacked to fire doors.	
	k. All fire barrier penetrations shall be provided with approved, through-penetration fire stops and/or protected by approved operable fire doors, fire dampers, or fire windows having the appropriate fire-resistive ratings.	
	l. Security systems shall not interfere with or affect the operation or integrity of fire doors (e.g., latch mechanisms), fire dampers, fire windows, or other fire protection system components.	
	m. Immediate action shall be taken to resolve any fire barrier deficiencies or impairments. Compensating measures determined by a qualified TOC FPE (in conjunction with the Hanford Fire Marshal) shall be implemented in accordance with TFC-ESHQ-FP-STD-04.	
10.	**Control Area.** Control areas are spaces within a building where quantities of hazardous materials (not exceeding allowable maximum quantities per control area) are stored, dispensed, used, or handled.	IBC Section 4.14

Item	Requirement	Source
	a. Construction Requirements: Control areas shall be separated from each other by fire barriers constructed in accordance with IBC Section 707, or horizontal assemblies constructed in accordance with IBC Section 712.	
	b. Percentage of Maximum Allowable Quantities: The percentage of maximum allowable quantities of hazardous materials per control area permitted at each floor level within a building shall be in accordance with IBC Table 414.2.2.	
	c. Number: The maximum number of control areas within a building shall be in accordance with IBC Table 414.2.2.	
	d. Fire Resistance Rating Requirements: The required fire-resistance rating for fire barriers shall be in accordance with IBC Table 414.2.2. The floor assembly of the control area and the construction supporting the floor of the control area shall have a minimum of 2-hour fire-resistance rating. *Exception*: The floor assembly of the control area and the construction supporting the floor of the control area are allowed to be 1-hour fire-resistance rated in buildings of Type IIA, IIIA, and VA construction, provided that both of the following conditions exist: • The building is equipped throughout with an automatic sprinkler system in accordance with IBC Section 903.3.1.1; and • The building is three stories or less above grade. See Attachment 2 for additional guidance and explanation.	
11.	**NFPA 80**. NFPA 80, NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems," and the IBC provide guidance on the protection of openings in fire-rated construction.	
	a. Fire dampers are not required when ducting penetrates 1-hour fire-rated construction. The duct should pass through the wall and extend into the area to be considered. The areas on either side of the wall should be completely protected by automatic sprinklers in order to eliminate the dampers. Transfer grills and other similar openings without ducting should be provided with an approved damper.	DOE-STD-1066-2012

Item	Requirement	Source
	b. Fire dampers in duct work should not be utilized when penetrating the fire-rated construction where the ducting is an integral part of the nuclear air filter system equipment that is required to continuously function as part of the confinement system. Such duct material penetrating fire-rated construction without fire dampers should: be made part of that fire-rated construction by either wrapping, spraying, or enclosing the duct with an approved material; or by other means of separating the duct material from other parts of the building with equivalent required fire-rated construction; or be qualified by an engineering analysis for a 2-hour fire-rated exposure to the duct at the penetration location.	
12.	**Fire Areas**. Facilities shall be subdivided into separate fire areas as determined by the FHA or other appropriate design documentation. Fire areas can be separated from each other by fire walls, separation from exterior fire exposure, or other approved means. a. A fire area is defined as a location bounded by fire barrier walls having a minimum fire resistance rating of 2 hours. b. Fire barriers used to separate hazards shall have adequate fire resistance to achieve the intended fire separation, including protection of openings and penetrations, and should have a minimum 2-hour fire-resistance rating (or as required by the IBC or NFPA) or be demonstrated as adequate by documented analysis. Meet or exceed applicable IBC and NFPA codes and standards as follows: a. Facilities or modifications thereto must be constructed to meet codes and standards in effect, when design criteria are approved, otherwise known as the COR. See Section 3.2 item 12. 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 FHA review	DOE O 420.1C DOE-STD-1066-2012

Item	Requirement	Source
	process, or during the construction review or permitting process.	
	c. If applicable, ensure assumptions of combustible loading in the facility FHA are protected, or update the FHA for anything falling outside the analyzed criteria.	
	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-1066-2012).	
	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 MGT-ENG-IP-05 and DOE-STD-1066-2012).	
	f. Redundant fire protection systems in areas where—	
	(1) safety class systems are vulnerable to fire damage, and no redundant safety capability exists outside of the fire area of interest or	
	(2) The maximum possible fire loss (MPFL) exceeds limits established by DOE.	
	(3) In new facilities, redundant safety class systems (other than fire protection systems) must be located in separate fire areas.	
	(4) A means (e.g., fire alarm or signaling system) to notify emergency responders and building occupants of a fire.	
	(5) Emergency egress and illumination for safe facility evacuation in the event of fire as required by applicable codes or fire hazards analysis.	
	(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).	
	(7) A means to prevent the accidental release of significant quantities of contaminated products of	

Item	Requirement	Source
	combustion and firefighting 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 documented safety analysis (DSA) in conjunction with other facility or site environmental protection measures. (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. (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.	

3.4 Fire Protection Systems

Item	Requirement	Source
1.	Fire protection system design, installation, and acceptance testing shall comply with the applicable and/or required codes and standards of the NFPA and HNF-36174.	TFC-PLN-13
2.	A reliable and adequate water supply for fire suppression shall be ensured during design and after construction. A reliable and adequate water supply and distribution system shall be provided for fire suppression, as documented through appropriate analysis. Redundant water supplies (storage and pumping systems) are necessary when either a fire protection water supply system is classified as safety class (see DOE-STD-1066-2012, Appendix A), or when the MPFL exceeds $350 million in any site facility.	DOE O 420.1C DOE-STD-1066-2012 MGT-ENG-IP-05
3.	Listed and/or approved control valves should be installed at maximum intervals of not more than 5,000 ft on long supply lines and at maximum intervals of not more than 1,200 ft on main distribution loops, feeders, and all primary branches connected to these lines. Such control valves should also be installed at selected points throughout the distribution system to provide system control over each service area. At intersections of distribution mains, one less control valve than the total number of intersecting mains may be provided. As an aid in determining the minimum number of sectional control valves, the critical nature of the	DOE-STD-1066-2012

Item	Requirement	Source
	building/facility should be considered, as well as the number of fire and domestic systems affected in a potential line failure.	
4.	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 in. in diameter. Sectional valves shall be installed as described in item 5, below. Adequacy. The water supply shall be designed to meet the following combined demands for a period of not less than 2 hours: (1) largest single fire suppression system; (2) 500 gallons per minute (gpm) for fire hose streams; and (3) uninterruptable domestic and process demands.	DOE O 420.1C MGT-ENG-IP-05
5.	Multiple sectional isolation valves shall be provided at each intersection between a supply source and a main loop (one valve for each leg).	
	a. 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 primary control valve.	
	b. 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 (e.g., computer room, loading dock, freezer).	DOE O 420.1C MGT-ENG-IP-05
	c. Underground distribution systems for fire protection water supplies 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 $5 million.	
	d. Application of this requirement to facilities that are existing will be made on a case-by-case basis after consultation with the ORP AHJ and contracting officer.	
	e. A minimum of two operational fire hydrants shall be provided for each building where parts of the	

Item	Requirement	Source
	exterior of the building shall be reached by hose lays of not over 350 ft with consideration given to accessibility and obstructions. Fire hydrants should be ≥40 ft from buildings and branch piping between the water main and a hydrant should not be greater than 300 ft.	
	f. 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 ft of fire department connections. Hydrants shall be of the standard type used at Hanford.	
6.	Fire flows shall be available for a period of at least two hours. A minimum 4-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.	DOE O 420.1C MGT-ENG-IP-05
7.	**Fire Protection System Design**. 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 1910.159 and 1910.165). The FPE 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.	29 CFR 1910.159 29 CFR 1910.165 HNF-36174
8.	**Fire Protection Equipment Compatibility.** All devices and appliances that receive their power from the initiating device circuit or signaling line circuit of a control unit shall be listed for use with the control unit. Nationally Recognized Testing Laboratories listings and approvals can be verified through various websites associated with the applicable entity (e.g., https://www.fmapprovals.com/, https://iq.ulprospector.com/en/).	NFPA 72
9.	Design authorities define the quality level of fire systems through an evaluation of both safety and project risk.	Fire Marshal's Charter

Item	Requirement	Source
	Unless specified otherwise, fire systems maintenance shall provide Quality Level 0 services as defined in TFC-ESHQ-Q_ADM-C-01.	
10.	All equipment components specified in designs shall be compatible with existing equipment and, installed as required by the applicable NFPA codes and standards.	DOE-STD-1066-2012 Fire Marshal's Charter HNF-36174 MGT-ENG-IP-05 R3
11.	**Acceptance Tests**. 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, 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. Fire alarm system acceptance test plans shall be developed using the template approved by the Hanford Fire Department.	NFPA 1; 13.1 TFC-PLN-98
12.	Acceptance test procedures required for all new fire system installations and/or modifications shall be reviewed and approved by the Hanford Fire Marshal or a qualified TOC FPE prior to execution.	Fire Marshal's Charter
13.	Multiple fire protection approaches shall be provided for property protection in areas where the MPFL exceeds $150 million. When multiple fire protection approaches are required for other than nuclear safety (e.g., property protection, mission continuity), any two of the following are considered satisfactory: a. Automatic suppression systems (e.g., fire sprinklers, foam, gaseous, explosion suppression, or other specialized extinguishing systems plus appropriate alarms). An adequate extinguishing agent supply, storage, and distribution system is an essential element. b. Automatic fire detection, occupant warning, manual fire alarm, and fire alarm reporting systems (considered together) combined with a sufficiently staffed, properly equipped, and adequately trained fire department or brigade that is able and committed to respond in a timely and effective manner. c. Fire barriers of sufficient ratings.	DOE-STD-1066-2012

Item	Requirement	Source
	d. For outdoor locations, sufficiently rated fire barriers, or a combination of physical separation and barriers.	
	e. Additional fire protection features may be determined based on the FHA in concert with the DSA or other safety basis documentation. DOE-STD-1066-2012, Appendix A provides further information applicable to new safety class and safety significant fire protection systems for Hazard Category 1, 2, and 3 nuclear facilities.	
14.	**Automatic Fire Suppression Systems**. 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 (MGT-ENG-IP-05).	DOE O 420.1C MGT-ENG-IP-05
15.	Where required, automatic sprinkler systems shall be designed and installed per NFPA 13 and HNF-36174. Complete automatic fire suppression system per NFPA standards are required in all structures having an (MPFL (defined by DOE-STD-1066-2012) in excess of $5 million, when required by a NFPA standard, or when the IBC requires it for construction, height, allowable square footage size, construction type or occupancy classification. When the MPFL exceeds $150 million, additional fire protection approaches (e.g., a fire suppression system and a fire detection and alarm system, previously known as 'a redundant fire protection system') are required. When the MPFL exceeds $350 million, additional fire protection approaches plus engineered fire barriers are required to limit MPFL to $350 million. Application of this requirement to existing facilities that have a short life shall be applied on a case-by-case basis using the FHA process. Automatic fire suppression systems shall be installed throughout new facilities exceeding 5,000 ft^2 of floor area.	DOE O 420.1C DOE STD-1066-2012 HNF-36174 MGT-ENG-IP-05 TFC-PLN-13
16.	**Hydraulic Design**. Hydraulically designed sprinkler systems shall be designed in accordance with NFPA 13. Hydraulically designed sprinkler systems shall include the following:	DOE-STD-1066-2012 HNF-36174 IBC/IFC NFPA 13

a. Occupancy classification for the sprinkler system, defined in NFPA 13, should not be less than an Ordinary Hazard Group 2 for Nuclear Category 1, Nuclear Category2, or Nuclear Category 3 facilities.

It is TOC policy to require a minimum sprinkler design density of 0.20 gpm/ft^2 over 1,500 ft^2 for all occupancies.

b. For other facilities, the occupancy classification for the sprinkler system, defined in NFPA 13, should not be less than an Ordinary Hazard Group 1, or as directed by a qualified TOC FPE.

It is TOC policy to require a minimum sprinkler design density of 0.20 gpm/ft^2 over 1,500 ft^2 for all occupancies.

c. Light hazard automatic sprinkler density, as defined by NFPA 13, is not acceptable.

d. Water supply pressure of at least 10 percent, but not less than 10 psi, below the water supply curve to provide a pressure margin to accommodate minor system modifications or degradation of the water supply and sprinkler systems that may occur over time.

e. When the building is seismically designed, sway bracing for seismic supports of sprinkler piping shall be based on the site-specific acceleration criteria. Seismic restraints shall be designed as required in NFPA 13.

NOTE 1: Secondary containment in buildings with surface contamination, or could result in release of radioactive material and are protected by automatic sprinkler protection, collection facilities shall be sized to contain the capacity of at least 30 minutes sprinkler system operation plus the volume of the largest tank or vessel in the protected fire area. The sprinkler output shall be the designed density over the entire design area, or as approved by a qualified TOC FPE.

NOTE 2: Secondary containment in non-nuclear buildings protected by automatic sprinklers where surface contamination or potential for release of radioactive material is not an identified hazard, collection facilities shall be sized to contain the capacity of at least 20 minutes sprinkler system operation plus the volume of the largest tank or vessel in the protected fire area. The sprinkler output shall be the designed density over the

Item	Requirement	Source
	entire design area, or as approved by a qualified TOC FPE. f. If the facility contains surface contamination, or if the fire could result in the release of radioactive material, the fire suppression water shall be contained, monitored, and treated as necessary. The containment system shall be capable of collecting fire suppression water for a minimum of 30 minutes. g. Hydraulic calculations shall be performed for new sprinkler system designs, designs of system modifications, and to verify sprinkler system capability using the Hydraulic Analyzer of Sprinkler Systems® (HASS®) sprinkler system hydraulic calculation program approved for use by a qualified TOC FPE. Hydraulic calculations shall be: • Performed by a qualified TOC FPE, or • Performed by an engineer under direct supervision of a qualified TOC FPE, or • Reviewed and approved by a qualified TOC FPE. h. All drawings, plans, sections, and details shall be useable and readable when printed on an 11” × 17” sheet of paper. A qualified TOC FPE has the authority to reject drawings deemed unusable or unreadable. i. Consideration should be given to future use of the building in new sprinkler system designs. Additional fire protection features may be determined based on the FHA in concert with the DSA or other safety basis documentation. (DOE–STD-1066-2012, Appendix A provides further information applicable to new safety class and safety significant fire protection systems for Hazard Category 1, 2, and 3 nuclear facilities.)	
17.	**Special Suppression Systems**. When automatic sprinkler or water spray protection systems cannot be safely employed or need to be supplemented, the decision to install another type of fire suppression system should be based on engineering analysis performed by, or under the direction of, an FPE. In addition to initial design and installation cost, the analysis should consider, the long-	DOE-STD-1066-2012

Item	Requirement	Source
	term cost of inspection, testing, and maintenance (ITM) of the system over its useful life, especially where access for the performance of increased ITM activities may be difficult due to security or radiological concerns.	
18.	**Drainage**. When high-value property; safety structures, systems, and components; or critical process equipment is subject to flooding from the discharge of automatic sprinkler systems and/or use of manual hose streams, protection against water damage shall be provided by one or more of the following: • Floor drains • Pits, sumps, and sump pumps • Equipment pedestals • Other acceptable alternatives.	DOE-STD-1066-2012

3.5 Confinement Systems

Item	Requirement	Source
1.	When required by DOE O 420.1C, the confinement structure surrounding critical areas and their supporting members are to remain standing and continue to act as a confinement structure during anticipated fire conditions, including failure of any fire suppression system. Fire resistance of this shell should be attained by an integral part of the structure (e.g., concrete slabs, walls, beams, columns) and not by composite assembly (membrane fireproofing). In addition, the structure's fire resistance rating shall be designed for the maximum fire exposure and duration anticipated, but not less than 2 hours. a. Hot cells and canyons shall be constructed of noncombustible or fire-resistive material to prevent fires from spreading into or out of the hot cell or canyon. b. If oil filled windows are necessary for radiation shielding, they shall be protected with automatic sprinklers in accordance with NFPA 13 criteria for windows or other methods (e.g., fire shutters or other methods supported by fire test evaluation results). c. Fire protection in or around nuclear confinement ventilation systems in facilities shall be designed to accomplish the following objectives: • Prevent fires from affecting the operation of the ventilation system; • Protect the filtration function; and,	DOE-STD-1066-2012

Item	Requirement	Source
	• Prevent the release of material that has accumulated on filters.	
	d. All electrical wiring located in the enclosure shall be in metal conduit.	
2.	**Filter Housing Construction**. ASME AG-1, "Code on Nuclear Air and Gas Treatment," provides requirements for the performance, design, construction, acceptance testing, and quality assurance of HEPA filters and other components used in nuclear ventilation exhaust systems. Filter enclosure assemblies shall be of noncombustible construction.	
	a. When nuclear HEPA filters serve as the final means of effluent cleaning, a minimum of two stages of HEPA filters should be arranged in series in the final filter plenum. In existing HEPA installations, one of the two stages of final HEPA filters may be located upstream from the final filter plenum.	
	b. Separate buildings which house filter plenums should be a minimum of: 2-hour fire-rated construction when located less than 5 ft from an adjacent building; 1-hour fire-rated construction when located more than 5 ft, but not more than 20 ft from an adjacent building; and, unprotected, noncombustible construction, when greater than 20 ft, provided that no unprotected openings occur in the adjacent building.	DOE-STD-1066-2012
	c. Filter plenum housings need not be fire-rated or separated from an adjacent building if the adjacent building wall is of minimum 2-hour fire-rated construction with no unprotected openings.	
	Location of Final Filter Assembly Ventilation System Equipment. Final filter assemblies and associated duct work and fans should be protected against exposure fires capable of affecting the operation of the filtration system. Filter assemblies and associated fans located inside buildings should be separated from all other parts of the building by 2-hour fire-rated construction. Buildings and the room/enclosure around the filter assembly and fans should be provided with appropriate fire protection systems.	
	a. In addition to the 2-hour fire separation described above, filter assemblies and associated fans, located on the roof of the buildings they ventilate, should be protected against exposure fires either by fire barriers or spatial separation.	

Item	Requirement	Source
	b. Filter plenums located near combustible or flammable liquid storage buildings or tanks should be located not less than 50 ft away from the buildings or tanks and should be housed in minimum 2-hour fire-rated construction. **Walk-in Filter Plenums**. Filter plenum enclosures should be used only for ventilation control equipment. The storage and accumulation of combustible materials, as well as combustible and flammable liquids in any quantity, are not permitted. In addition, the storage of spare filters inside the filter plenum is not permitted. **Combustible Gases or Vapors**. When operations or processes involve flammable or combustible liquids that produce combustible gases or vapors, the concentration of the gases or vapors inside the final filter plenum should not exceed 25 percent of their lower flammability limit inside the filter enclosure (see NFPA 69).	
	3. **Protection of the Final Filter Plenum**. Protect the final filter plenum from dust and particulate loading by using duct entrance filters or prefilters or a combination of both as follows: a. Gloveboxes, hot cells, and fume hoods connected to containment ventilation systems should be provided with at least moderately efficient (30 to 45 percent atmospheric dust spot efficiency based on ASHRAE 52-76.2 with a minimum efficiency of MERV 8) duct entrance filters. b. High-efficiency (ASHRAE 52.2 with a minimum efficiency of MERV 12 at least 80 percent atmospheric dust spot efficiency based on ASHRAE 52-76 test method) prefilters should be provided in the ventilation system to protect the final HEPA filters from: (1) particles with diameters larger than 1 or 2 microns; (2) lint; and (3) dust concentrations greater than 10 grains per 1,000 cubic feet (30 cubic meters). High-efficiency prefilters not only provide a degree of fire protection to the final HEPA filters, but can also extend the operational life of the HEPA filters.	DOE-STD-1066-2012

Item	Requirement	Source
	c. Prefilters that should be located in final filter plenums enclosures should be high-efficiency prefilters (at least 80 percent ASHRAE atmospheric dust spot efficiency). These prefilters should be located at least 36 in. (91 cm) upstream from the final HEPA filters. When airborne materials are known to be combustible (e.g., metal powders), replaceable prefilters should be located as near to the source as possible. Prefilters should not be located where there is an unacceptable radioactive hazard to personnel changing the prefilters.	
	d. Filter Plugging. HEPA filters serving as final filters should be protected from excessive pressure drops across the filter media from plugging by soot and smoke particles from a fire in the area or equipment. This plugging may be controlled by suppressing the fire and by providing filters upstream of the final HEPA filters.	
	e. Fire screens should be located upstream from the prefilters and final filter plenums. Duct entrance filters may not require fire screens unless a significant amount of combustible materials are present in the exhaust stream exiting the duct.	
	f. Pyrophoric Metals. When operations or processes involve pyrophoric materials that may subject the final filter enclosure to the pyrophoric particulates, a method to remove the dust particles before reaching the final filters enclosure (e.g., a prefilter or duct entrance filters) should be installed between the source of the material and the final filters.	
4.	**Fire Detection**. Rate compensated type heat detectors approved for the specified use should be provided in the HEPA filter enclosure serving as the final filter. Such detectors should be of the 190 °F (89°C) temperature range, unless operations require higher temperature air flows. Airflow should be considered when determining detector location. Detectors should be arranged to detect a fire in the first stage of HEPA filters. This could require detectors on both the upstream and downstream side of the first stage of HEPA filters. Control units and signaling alarm systems connected to the heat detectors should be listed for their intended purpose. If filter plenum automatic deluge spray systems are actuated by pilot sprinkler heads, heat detectors are not required in the ducting or the filter enclosure, unless specified by the AHJ.	DOE-STD-1066-2012
5.	**Detection Testing Capability.** Detector installations should be engineered and installed so that they can be tested during the life of the detector. Remote testing should be provided for detectors that are not accessible due to unacceptable hazards. One method	DOE-STD-1066-2012

Item	Requirement	Source
	of providing remote testing is to provide detectors with heating strips or coils that can be energized by a separate control unit. If a line-type heat detection system is used, a heat testing pad should be provided outside the plenum for operability testing of the system.	
	a. When high contamination levels do not exist, detectors may be installed so that the detector can be removed from the plenum enclosure and tested externally.	
6.	**Temperature Control from Fire Exposure**. Filters should be protected from overheating to prevent filter weakening and potential ignition in the event of a fire in the area or the equipment being ventilated. This cooling should be accomplished by one or more of the following: (1) sufficient cooling with dilution air, or (2) automatic sprinkler or water spray protection in the filter enclosure inlet duct. Such cooling equipment is to be treated as a required support system when the ventilation equipment is safety class or safety significant.	
	a. **Suppression of Fires in Final HEPA Filters (when HEPA filters serve as the final means of effluent treatment)**. The provisions of this section are intended to prevent HEPA filter media from being ignited. A capability to suppress a fire shall be provided in final HEPA filter plenums, with the primary objective to prevent an unacceptable release of radioactive materials on the filters. This suppression capability may be provided by a manual deluge system or bubble-tight isolation dampers, depending on analysis in the FHA. If the FHA determines that isolation of the assembly described below is insufficient to prevent release (e.g., the filter fire is deemed severe enough to breach the filter assembly enclosure prior to suffocation from isolating any inlet air), sprinkler or water spray protection should be provided as described in the following sections.	DOE-STD-1066-2012
	b. **Isolation Dampers**. If air-tight isolation dampers are provided in the inlet and outlet ducts to prevent the release of radioactive material accumulated on the final filters resulting from a filter fire, these dampers should be able to be operated remotely and from a safe location. Such dampers and associated equipment are to be treated as a required support system when the ventilation equipment is safety class or safety significant. Use of isolation dampers for fire suppression should not be used in facility design unless a redundant filter bank is available to maintain active confinement ventilation.	

Item	Requirement	Source

c. **Deluge Spray Suppression Systems Location.** When required by this standard, automatic and manual water deluge spray systems should be designed in accordance with the following requirements.

1. Automatic deluge spray systems provided upstream of the HEPAs should be designed per the applicable provisions of NFPA 13 and NFPA 15, and as follows:

   - Density - water spray density should be 0.25 gpm/ft^2 over the entire filter area or 1 gpm per 500 cubic feet per minute (cfm) air flow, whichever is greater;

   - Sprinkler head type - spray sprinkler heads should be deluge type sprinkler heads;

   - Location from prefilters or demisters - the spray pattern of the deluge sprinkler head should be in the form of a downward vertical water curtain approximately 6 in. in front of the prefilter or demister and deluge sprinkler heads should be spaced so that each sprinkler head does not exceed 4 lineal feet of curtain coverage; and

   - Activation by detection - a deluge spray sprinkler system should operate upon activation of fire alarm system heat detectors or pilot sprinkler heads, located in either the final ducting or filter plenum housing. Manual activation should be provided as well.

2. Manual deluge spray systems provided in the HEPA enclosure should be designed per NFPA 15 and modified as follows:

   - Location from filters - spray nozzles should be horizontally directed at the face of the first stage of HEPA filters so that all areas of the first stage filters and framing support system are wetted; and

   - Activation by manual operation - activation should be by manually activating a deluge valve or opening a normally closed outside screw and yoke

Item	Requirement	Source
	gate valve. Control devices to activate the spray nozzle deluge valve should be provided in the process operator's control room or other locations accessible to emergency responders. When a deluge valve is utilized, manual activation may be provided at the deluge valve as well.	
7.	**Demister Guidelines**. When automatic deluge spray systems are installed in filter housing enclosures, a means to protect HEPA filters from moisture should be provided, such as a demister installed downstream of the automatic deluge spray sprinkler heads and upstream of the first stage of HEPA filters. When used, demisters should meet the airflow and moisture removal performance requirements found in ASME AG-1, Article FA-4200. Demisters should have a nearly 100 weight percent efficiency for water drops 50 microns and larger. They should have an efficiency greater than 99 weight percent for 1 to 50 microns with air flow velocities of 500 to 600 ft per minute, or at operating air flow velocities with operating water flow deluge spray delivery rate. Demisters should be located as far away as possible from the HEPA filters (a minimum of 36 in.) and approximately 6 in. from the deluge spray sprinkler heads.	DOE-STD-1066-2012
8.	**Water Supply Guidelines**. Water for the deluge spray systems should be provided by two separate water supply connections for reliability (one may be a fire department connection, if acceptable to the AHJ). Automatic and manual water spray system water supplies should be hydraulically calculated and capable of supplying a simultaneous flow of the automatic and manual water spray systems, as well as the overhead ceiling automatic fire sprinkler systems for the fire area providing air to the plenum for a minimum period of 2 hours. A minimum 2-hour water supply is not required when a limited water supply system, discussed in item 10 below, is justified and provided for criticality event reasons.	DOE-STD-1066-2012
9.	**Water Drains**. Water drains with traps and a means to eliminate drain trap evaporation should be provided in plenum floors to provide liquid run off control. Plenum drains should be piped to either a process waste system or to collection tanks. Process waste systems and collection tanks should be of sufficient capacity to capture all liquid from the water deluge spray systems for the densities and durations required herein. Criticality safety should be observed in all drainage and storage systems when the potential for impacting fissile materials is encountered.	DOE-STD-1066-2012
10.	**Limited Water Supply Suppression Systems**. Limited water supply systems for the deluge water supply should be permitted when a documented criticality potential exists in the final filter	DOE-STD-1066-2012

Item	Requirement	Source
	plenum. A documented criticality potential should be provided showing criticality calculations and the total amount of water allowed in the plenum enclosure before a limited water supply system is permitted. Limited water supply can be accomplished by either limited capacity water tanks or system water flow control valves.	
11.	**Lighting and Window Viewing Ports.** Lighting should be provided inside the filter plenum in front or between the filter banks in the area where automatic and manual heads and nozzles are located. Such lighting may be provided with an on and off switch provided that the switch is located outside the plenum at an accessible location. Window viewing ports made up of wire glass, laminated lead safety glass, or fire-rated glass should be provided for viewing inside the filter plenum. The window viewing ports should be provided at each location where fire protection spray system heads and nozzles are located and should be placed in such a way with enough windows so all heads and nozzles are visible from outside the filter plenum.	DOE-STD-1066-2012

4.0 DEFINITIONS

Building. Any structure utilized or intended for supporting or sheltering any occupancy (IBC, Section 202).

Combustible (material). A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited combustible (NFPA 1, Section 3.3.57).

Noncombustible. A material that complies with any one of the following shall be considered noncombustible material (NFPA 1, Section 4.5.9):

1. The material, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.

2. The material is reported as passing ASTM E136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

3. The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750 Degrees C.

Relocatable Structure. Facilities including manufactured structures, mobile homes, trailers, semi-trailers, modular type structures, factory assembled structures, cargo containers, conex boxes, conex boxes modified for office space, hazardous materials or flammable liquid storage containers, air-supported/inflated structures, tent/membrane, and cloth/rib structures. This term does not apply to trailers and cargo containers that are being used in the transportation mode for conveying materials while onsite, or to prefabricated buildings designed for a permanent location.

Structures not specifically identified herein should be referred to the AHJ for categorization (DOE-STD-1066-2012, Section 1.5).

Structure. That which is built or constructed (IBC, Section 202).

Temporary (Structure). A building or structure erected for a period of less than 180 days (IBC, Section 3103.1).

5.0 SOURCES

5.1 Requirements

5.1.1 10 CFR 851, "Worker Safety and Health Program."

5.1.2 29 CFR 1910.159, "Automatic Sprinkler Systems."

5.1.3 29 CFR 1910.165, "Employee Alarm Systems."

5.1.4 DOE O 420.1C, "Facility Safety."

5.1.5 DOE-STD-1066-2012, "Fire Protection."

5.1.6 MGT-ENG-IP-05 R3, "ORP Fire Protection Program."

5.2 References

5.2.1 29 CFR 1910, "Occupational Safety and Health Standards."

5.2.2 29 CFR 1926, "Safety and Health Regulations for Construction."

5.2.3 ASHRAE 52.2, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size."

5.2.4 ASME AG-1, "Code on Nuclear Air and Gas Treatment."

5.2.5 ASTM E108, "Standard Test Methods for Fire Tests of Roof Coverings."

5.2.6 ASTM E648, "Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source."

5.2.7 ASTM E84, "Standard Test Method for Surface Burning Characteristics of Building Materials."

5.2.8 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."

5.2.9 DOE-STD-2010-12, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities."

5.2.10 FM Global Property Loss Prevention Data Sheet 5-4, "Transformers."

5.2.11 FM Global Property Loss Prevention Data Sheets 1-28R, “Roof Systems.”

5.2.12 FM Global Property Loss Prevention Data Sheets 1-31, “Metal Roof Systems.”

5.2.13 HNF-36174, “DOE Fire Protection Handbook – Hanford Chapter.”

5.2.14 International Building Code (IBC).

5.2.15 International Fire Code (IFC).

5.2.16 NFPA 1, “Fire Code.”

5.2.17 NFPA 101®, “Life Safety Code®.”

5.2.18 NFPA 13, “Standard for the Installation of Sprinkler Systems.”

5.2.19 NFPA 15, “Standard for Water Spray Fixed Systems.”

5.2.20 NFPA 253, “Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.”

5.2.21 NFPA 255, “Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.”

5.2.22 NFPA 400, “Hazardous Materials Code.”

5.2.23 NFPA 5000, “Building Construction and Safety Code.”

5.2.24 NFPA 69, “Standard for Explosion Prevention Systems.”

5.2.25 NFPA 70®, “National Electrical Code®.”

5.2.26 NFPA 72®, “National Fire Alarm and Signaling Code®.”

5.2.27 NFPA 780, “Standard for the Installation of Lightning Protection Systems.”

5.2.28 NFPA 80, “Standard for Fire Doors and Other Opening Protectives.”

5.2.29 NFPA 801, “Fire Protection for Facilities Handling Radioactive Materials.”

5.2.30 NFPA 90A, “Standard for the Installation of Air-Conditioning and Ventilating Systems.”

5.2.31 SFPE Engineering Guide to Performance-Based Fire Protection.

5.2.32 TFC-ENG-DESIGN-C-18, “Testing Practices.”

5.2.33 TFC-ENG-DESIGN-D-13.2, “Guidance for Applying Engineering Codes and Standards to Design.”

5.2.34 TFC-ESHQ-FP-STD-04, “Fire Protection System Inspection, Testing, Maintenance, and Discrepancies Management.”

5.2.35 TFC-ESHQ-FP-STD-06, “Fire Hazard Analysis and Fire Protection Assessment Requirements.”

5.2.36 TFC-ESHQ-FP-STD-13, “Fire Protection Requirements for Hazardous Material and Used Waste Absorbing Material Storage.”

5.2.37 TFC-ESHQ-Q_ADM-C-01, “Graded Quality Assurance.”

5.2.38 TFC-ESHQ-S-STD-05, “Walking and Working Surfaces.”

5.2.39 TFC-PLN-13, “Fire Protection Program.”

5.2.40 TFC-PLN-98, “Inspections, Tests, Analysis, and Acceptance Criteria (ITAAC) Program Plan.”

5.2.41 Tri-Party Agreement.

5.2.42 UL 790, “Standard for Standard Test Methods for Fire Tests of Roof Coverings.”

5.2.43 WAC 173-303, “Dangerous Waste Regulations.”

5.2.44 WRPS-2001731, “Tank Operations Contractor Fire Protection Program Duties and Commitments Evaluation (WRPS-PER-2020-0727).”

ATTACHMENT A – BASIC NFPA 101 (2015 EDITION) STAIR, RAMP, LANDING, HANDRAIL, AND GUARDRAIL REQUIREMENTS

STAIRS (Chapter 7)*

1. 36 inches, when the number of occupants is less than 50 (7.2.2.2.1.2(A)), or 44 inches for 50 or more occupants.
2. Maximum Riser Height: 7 inches measured from stair nosing to stair nosing (Table 7.2.2.2.2.1.1(a)).
3. Minimum Riser Height: 4 inches measured from stair nosing to stair nosing (Table 7.2.2.2.2.1.1(a)).
4. Minimum Tread Depth: 11 inches (Table 7.2.2.2.2.1.1(a)).
5. Minimum Head Room: 6 feet-8 inches (Table 7.2.2.2.2.1.1(a)).
6. Tread Slope: ≤ ¼ inches per foot (Table 7.2.2.2.2.1.1(a)).
7. Maximum height between landings: 12 feet (Table 7.2.2.2.2.1.1(a)).
8. Stairs shall be of permanent construction (7.2.2.3.1.1).
9. Maximum variation in depth of adjacent treads or height of adjacent risers: 3/16 inch (7.2.2.3.6.1).
10. Tolerance between largest and smallest tread and largest or smallest riser shall not exceed 3/8 inch in a flight of stairs (7.2.2.3.6.2).
11. Where the bottom or top riser adjoins a sloping sidewalk, driveway, or other permanent surface the bottom Riser shall not exceed a 1 inch per foot variation with respect to the ground level over the stair width (7.2.2.3.6.3).
12. Dimensional Uniformity (NFPA 101, Section 7.2.2.3.6)
    a. Section 7.2.2.3.6.1: Variation in excess of $^{3}/_{16}$ inch in sizes of adjacent tread depths or in the height of adjacent risers shall be prohibited. Measure nosing to nosing.
    b. Section 7.2.2.3.6.2: Variations between the sizes of the largest and smallest riser or between the largest and smallest tread depths shall not exceed ⅜ inch in any flight.

STAIRS (Chapter 40) for Accessing Industrial Equipment, Serving No More than 10 People (Section 40.2.5.2)*

1. Minimum stair clear width: 22 inches clear width between rails (Table 40.2.5.2.1).
2. Maximum Riser Height 9 inches measured from stair nosing to stair nosing (Table 40.2.5.2.1)
3. Minimum Tread Depth 10 inches (Table 40.2.5.2.1).
4. Minimum Head Room 6 feet-8 inches (Table 40.2.5.2.1).
5. Tread Slope ≤ ¼ inches per foot (Table 40.2.5.2.1)
6. Stairs shall be of permanent construction (7.2.2.3.1.1).
7. Maximum variation in depth of adjacent treads or height of adjacent risers: 3/16 inch (7.2.2.3.6.1).
8. Tolerance between largest and smallest tread and largest or smallest riser shall not exceed 3/8 inch in a flight of stairs (7.2.2.3.6.2).

ATTACHMENT A – BASIC NFPA 101 (2015 EDITION) STAIR, RAMP, LANDING, HANDRAIL, AND GUARDRAIL REQUIREMENTS (cont.)

9. Where the bottom or top riser adjoins a sloping sidewalk, driveway, or other permanent surface the bottom Riser shall not exceed a 1 inch per foot variation with respect to the ground level over the stair width (7.2.2.3.6.3).

STAIR LANDINGS*

1. Landings shall have a dimension, measured in the direction of travel, no less than the width of the stair (7.2.2.3.2.3).
2. Landings shall not be required to exceed 48 in in the direction of travel, provided that the stair has a straight run (7.2.2.3.2.4).
3. Where the total occupant load of all stories served by the stair is fewer than 50, the minimum width clear of all obstructions except projections not more than 4 1/2 in at or below handrail height on each side, shall be 36 in.
4. Landings adjacent to egress door and building floor shall be within ½ inch of the building floor level (7.2.1.3.1).
5. Landings shall be at least the width of the stair in the direction of travel, but not less than 36 inches (7.2.1.3.2).
6. Landing slope shall not exceed ¼ inch per foot, 1 in 48 (7.2.2.3.4).
7. In existing buildings, a door assembly at the top of a stair shall be permitted to open directly to the stair, provided that the door leaf does not swing over the stair and the door opening serves an area with an occupant load of fewer than 50 persons (7.2.2.3.2.5).

RAMPS (Table 7.2.5.3(a)*

1. Maximum slope of 1 in 12.
   Exception: Ramps serving vehicle access or vessels, or mobile structures.
2. Minimum clear width shall be at least 44 inches.
3. Maximum cross slope of 1 in 48.
4. Maximum rise of a single ramp run is 30 inches.
5. Landings shall be located at the top, bottom, and at change of direction of a ramp (7.2.5.4.2(1)).
6. Landings shall be no less than 60 inches long in the direction of egress travel, or as allowed by NFPA 101, Section 7.2.5.4 (7.2.5.4.2(4)). Consult with Fire Protection.
7. Landings not forming part of an "accessible" egress route are not required to exceed 48 inches in the direction of egress travel (7.2.5.4.2(5)). Consult with Fire Protection.
8. Landings shall be at least as wide as the ramp they serve (7.2.5.4.2(3)).

NEW HANDRAILS*

1. All stairs serving as required means of egress shall be of permanent fixed construction (7.2.2.3.1.1).
2. Handrails shall be provided on both sides of stairs (7.1.1.4.1.1).
3. Height shall be between 34 inches and 38 inches measured vertically from the leading edge of tread to top of rail (7.2.2.4.4.1).
4. Where the handrail forms part of a guard, the maximum handrail height shall not exceed 42 inches (7.2.2.4.4.3).
5. Clearance from handrail to the wall shall be less than 2 ¼ inches (7.2.2.4.4.5).
6. Handrails shall include one of the following (7.2.2.4.4.7):
   a. Circular cross section with diameter not less than 1 ¼ inches and not exceeding 2 inches.

ATTACHMENT A – BASIC NFPA 101 (2015 EDITION) STAIR, RAMP, LANDING, HANDRAIL, AND GUARDRAIL REQUIREMENTS (cont.)

   b. Other than circular shape with perimeter not less than 4 inches, but not exceeding 6 ¼ inches with largest cross section dimension not to exceed 2 ¼ inches with rounded edges of not less than 1/8 inches.

7. Must be continuously graspable along entire length (7.2.2.4.4.7).
8. Brackets of balusters attached to the bottom surface of the handrail are not obstructions if (7.2.2.4.4.8):
   a. There is at least 1 ½ inches of clearance below the handrail before these items project horizontally beyond the side of the handrail.
   b. They have edges with a radius of not less than 0.01 inches.
9. Handrails shall return to the wall or floor or terminate in newel posts (7.2.2.4.4.9).
10. Handrails shall extend horizontally for at least 12 inches above the top riser and continue to slope for a depth of one tread beyond the bottom riser (7.2.2.4.4.10).

NEW GUARDS (GUARDRAILS)*

1. Shall be provided at open sides of means of egress that exceed 30 inches in height (above the ground).
2. Shall not be less than 42 inches high (7.2.2.4.5.2).
3. Shall be designed with intermediate rails or ornamental design such that a 4 inch sphere cannot pass through the opening to a height of 34 inches (7.2.2.4.5.3).
   a. For triangular openings formed by the tread, riser, and bottom element of the guard, the guard design shall be such that a 6 inch sphere cannot pass through the triangular opening.

   Exception: Not required in industrial occupancies.

*For details pertaining to stair, landing, handrail, and guard other than specific details not identified above, or questions/clarifications contact WRPS Fire Protection at 373-2050 or 373-7392.

ATTACHMENT B - NON-INDUSTRIAL STAIRS/HANDRAILS/GUARDRAILS CHECKLIST

Location/Description: _____ **Work Order No.:** _____

ITEM NO.	STAIRS	Yes	No
1	Minimum stair width of 36 inches? (wall to wall, for occupants of 50 or less), 44 inches (for occupancies of greater than 50)		
2	Minimum tread depth of 11 inches?		
3	Tread and landing level? (tolerance of +/- ¼ inch per foot)		
4	Riser height is a minimum of 4 inches and a maximum of 7 inches?		
5	The maximum variation in adjacent tread/riser is 3/16 inch? (tread depth, riser height)		
6	The maximum variation between the largest and smallest riser is 3/8 inch?		
7	Landing is at least the width of the stairs?		
8	Stairs serving as required "*means of egress*" are of permanent fixed construction? (Anchored to base slab or trailer)		
9	Headroom clearance from top of riser is not less than 6 feet 8 inches?		
10	Platform, riser, and stairs are solid. (with exceptions for small openings)		
11	A flight of stairs does not have a vertical rise greater than 12 feet between floor levels or landings? (platform required every 12 feet in height)		
12	Landing level with floor inside of door within +0 inch, - ½ inch?		
	HANDRAILS	**Yes**	**No**
13	Handrail height is uniform and not less the 34 inches nor greater than 38 inches?		
14	Handrails continuous along both sides of entire stairway?		
15	Handrail unobstructed and at least 2 1/4 inches of clearance between handrail and wall?		
16	Round handrails have an outside diameter between 1 1/4 to 2 inches?		
17	Handrail gripping surface shall be continuous without interruption by newel posts or other obstructions?		
18	Handrail ends are returned to the wall or floor or terminate at a newel post?		
19	Handrail extends horizontally 12 inches beyond the top riser and 1 tread depth beyond the bottom riser?		

ATTACHMENT B - NON-INDUSTRIAL STAIRS/HANDRAILS/GUARDRAILS CHECKLIST (cont.)

Location/Description: _____ **Work Order No.:** _____

	GUARDRAILS	Yes	No
20	Guardrails are not less than 42 inches high?		
21	Guardrails continuous along entire platform and stair (guardrails required for platforms or stairs above 30 inches)?		
22	Openings in guardrails do not allow passage of a sphere 4 inches in diameter from the walking surface to the required guard height?		
	GENERAL INSTALLATION	**Yes**	**No**
23	The stairs and platform were installed to the dimensions and details per the approved drawings?		

NOTE: The above code checks are to the requirements of NFPA 101. If an item deviates from the code requirement, verify with Engineering.

COMMENTS:

INSPECTION PERSONNEL			
Inspection Personnel:			
	Print Name	Signature	Date
	Print Name	Signature	Date
	Print Name	Signature	Date
	Print Name	Signature	Date
APPROVAL OF COMPLETION			
FWS:			
	Print Name	Signature	Date

ATTACHMENT C - RAMP CHECKLIST

Location/Description: _____ **Work Order No.:** _____

ITEM NO.	RAMP	Yes	No
1	Is the ramp at least 44 inches wide?		
2	Is the rise of the ramp between landings no greater than 30 inches?		
3	Is the maximum slope 1 vertical to 12 horizontal?		
4	Is the cross slope of the ramp/landing a maximum of 1 vertical to 48 horizontal?		
5	Are ramps of permanent fixed construction? (Anchored to base slab or trailer)		
6	Is the ramp walking surface solid without perforations?		
7	Is the ramp walking surface of slip resistant material?		
8	Is headroom clearance from the ramp walking surface not less than 6 feet 8 inches?		
9	Is there a curb, wall, railing, or projecting surface that prevents people from traveling off the edge of the ramp? (Curbs are required to be a minimum of 4 inches)		
10	Are outside ramps more than 36 feet above the finished ground level provided with an opaque visual obstruction not less than 48 inches in height? (if applicable)		
11	Is there a landing at the top and bottom of the ramp?		
12	Is there a landing at changes of direction?		
13	Are landings at changes of direction at least 60 inches by 60 inches?		
14	Is the landing length at least the width of the stairs or at least 44 inch in direction of travel?		
15	Is the landing level with floor inside of door within +0 inch, - ½ inch?		
	HANDRAILS	**Yes**	**No**
16	Is the handrail height uniform and not less the 34 inches nor greater than 38 inches?		
17	Are handrails continuous along both sides of entire ramp? (for rise of greater than 6 inches)		
18	Is handrail unobstructed and does it have at least 2 1/4 inches of clearance between handrail and wall?		
19	Do round handrails have an outside diameter between 1 1/4 to 2 inches?		
20	Are handrail gripping surfaces continuous without interruption by newel posts or other obstructions?		
21	Do handrail ends return to the wall or floor or terminate at a newel post?		
22	Do handrails extend horizontally 12 inches beyond the top and bottom of the ramp?		

ATTACHMENT C - RAMP CHECKLIST (cont.)

Location/Description: _____ **Work Order No.:** _____

	GUARDRAILS	Yes	No
23	Are guardrails not less than 42 inches high?		
24	Are guardrails continuous along entire landing and ramp (guardrails required for landings or ramps above 30 inches)?		
25	Do openings in guardrails not allow passage of a sphere 4 inches in diameter?		
	GENERAL INSTALLATION	**Yes**	**No**
26	Were the stairs and platform were installed to the dimensions and details per the approved drawings? (if applicable)		

NOTE:

1. The above code checks are to the requirements of NFPA 101 and the International Building Code. Not all items or exceptions are included. If an item deviates from the code requirement, verify with Engineering.
2. If the ramp is used for access to industrial equipment, not all requirements apply.

COMMENTS:

INSPECTION PERSONNEL			
Inspection Personnel:			
	Print Name	Signature	Date
	Print Name	Signature	Date
	Print Name	Signature	Date
	Print Name	Signature	Date
APPROVAL OF COMPLETION			
FWS:			
	Print Name	Signature	Date

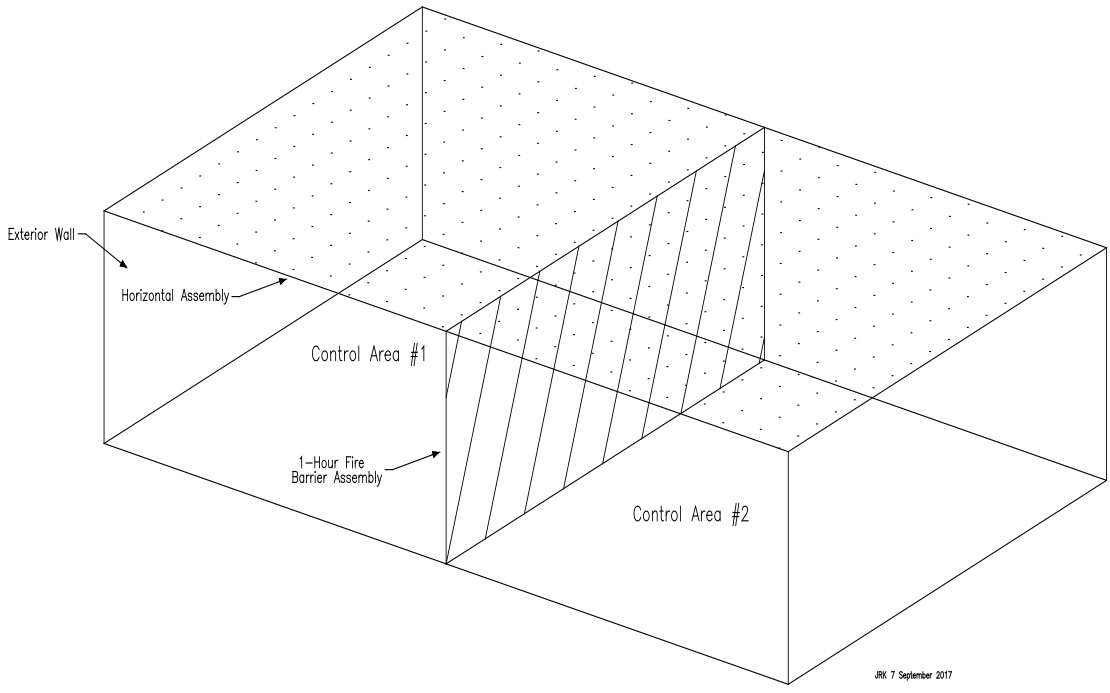
ATTACHMENT D - CONTROL AREA GUIDANCE

Source: International Building Code, 2015 Edition.
International Building Code, Code and Commentary, 2015 Edition

IBC 414.2, Definition: Control Area
Spaces within a building where quantities of hazardous materials not exceeding allowable maximum quantities per control area are stored, dispensed, used, or handled.

Discussion:
This requirement utilizes a limited density concept for hazardous materials through use of control areas. The intent of the control area concept is to provide an alternative method for handling of hazardous materials without classifying the occupancy as Group H. In order to no be considered Group H, the amount of hazardous materials within any single control areas bounded by fire barriers, horizontal assemblies, fire walls, and exterior walls cannot exceed the maximum allowable quantity for a specific material listed in IBC Table 307.1(1) or 307.1(2). A control area may be the entire building or a portion thereof. Note that when an entire building is the control area, the entire maximum allowable quantity of material from Table 307.1(1) or 307.1(2) located on any story is subject to the limitations of IBC Table 414.2.2. See Figures B-1 and B-2. NOTE: A horizontal assembly is a floor/ceiling assembly (Source: IBC Commentary).

Figure D-1. Control Areas.



ATTACHMENT D – CONTROL AREA GUIDANCE (cont.)

IBC 414.2.1, Construction Requirements
Control areas shall be separated from each other by fire barriers constructed in accordance with IBC Section 707 or horizontal assemblies constructed in accordance with IBC, Section 712.

Discussion:
Control areas are compartments of a building surrounded by fire barrier walls and fire resistance-rated horizontal assemblies. NOTE: A fire resistance-rated horizontal assembly is a floor/ceiling assembly tested and listed for a specific period of fire resistance; 1-hour, 2-hours, etc. If there are no fire barriers or fire resistance-rated horizontal assemblies, the entire building is a single control area, for the purpose of applying code provisions for a control area. Therefore, if more than the permitted maximum allowable quantities for Tables 307.1(1) or 307.1(2) are anticipated in the building, additional control areas with minimum 1-hour fire barrier wall construction (2 hours where more than three stories) must be provided in order to not warrant a high-hazard occupancy classification. The provisions for required fire barriers also minimize the possibility of simultaneous involvement of multiple control areas due to a single fire condition. A fire in a single control area would involve only the amount of hazardous materials as limited by the maximum allowable quantities (Source: IBC Commentary).

IBC 414.2.2, Percentage of Maximum Allowable Quantities
The percentage of maximum allowable quantities of hazardous materials per control area permitted at each floor level within a building shall be in accordance with Table 414.2.2.

Discussion:
Table 414.2.2 specifies the percentage of maximum allowable quantities of hazardous materials per control area dependent on the location on a given floor level with respect to grade. The noted percentages are a percentage of the maximum allowable quantities of hazardous materials permitted per control area in accordance with Tables 307.1(1) or 307.1(2).
For example, Table Tables 307.1(1) would allow 240 gallons of Class 1B flammable liquid per control area in a fully sprinklered building (See Table 307.1(1), Note d) Table 414.2.2, in turn, would allow 75 percent of the maximum allowable quantities per control area for control areas located on the second floor level above grade. As such, 180 gallons of Class IB flammable liquids per control area could be located on the second floor of a fully sprinklered building without classifying the building as a high-hazard occupancy (Source: IBC Commentary).

IBC 414.2.3, Number
The maximum number of control areas within a building shall be in accordance with Table 414.2.2.

ATTACHMENT D – CONTROL AREA GUIDANCE (cont.)

Discussion:
The maximum quantity of hazardous materials, therefore, which are permitted in a building without classifying it as a high-hazard occupancy, is regulated per control area and not per building area. The quantity limitation for the entire building would be established based on the number of permitted control areas on each floor of the building in accordance with Table 414.2.2. Based on the table, the first floor could contain four control areas with up to 100 percent of the maximum allowable quantity of hazardous materials per control area. For example, a single control area in a nonsprinklered building could contain up to 30 gallons of Class 1A flammable liquids, 125 pounds of Class 2 oxidizers, and 500 gallons of corrosive liquids based on the maximum allowable quantities of Tables 307.1(1) and 307.1(2). Those quantities could be contained in each of four different control areas, provided that all control areas are separated from each other with minimum 1-hour fire barriers and horizontal assemblies. Please note that in order to have more control areas per floor than indicated in Table 414.2.2, a fire wall in accordance with Table 706 would be required in order to create separate additional building areas (fire areas as defined by DOE STD 1066-2012).

IBC Table 414.2.2
Design and Number of Control Areas

Floor Level		Percentage of MAQ per Control Area[a]	Number of Control Areas Per Floor	Fire Resistance Rating for Fire Barriers (in hours)[b]
Above Grade	Higher than 9	5	1	2
	7-9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below Grade	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in (IBC) Tables 307.1(1) and 307.1(2) with all increases allowed in the notes to those tables.
b. Fire barriers shall include walls and floors as necessary to provide separation from other portions of the building.

ATTACHMENT D – CONTROL AREA GUIDANCE (cont.)

IBC 414.2.4, Fire-Resistance Rating Requirements

The required fire-resistance rating for fire barriers shall be in accordance with Table 414.2.2. The floor assembly of the control area and the construction supporting the floor of the control area shall have a minimum of 2-hour fire-resistance rating.

Exception: The floor assembly of the control area and the construction supporting the floor of the control area are allowed to be 1-hour fire-resistance rated in buildings of Type IIA, IIIA, and VA construction, provided that both of the following conditions exist:

1. The building is equipped throughout with an automatic sprinkler system in accordance with IBC Section 903.3.1.1; and
2. The building is three stories or less above grade.

Discussion:

The fire separation requirements for control areas, both horizontal and vertical, is dependent on their location in a building in accordance with Table 414.2.2. The amount of hazardous materials per control area, as well as the number of control areas per floor, are reduced if stored or used above the first floor. See Figure 2.

Where the control area is located above the first floor, the floor assembly and all supporting construction of the control area would require a minimum 2-hour fire-resistance rating. The required 2-hour fire-resistance rating of the floor construction only refers to the floor of the control area. The increased fire-resistance rating and reduced quantities are intended to aid fire department personnel. The use of intended control areas on upper floors provides an alternative method for multistory research and laboratory-type facilities that may need to use a limited amount of hazardous materials throughout various portions of the building. Without control areas, the maximum allowable quantity for a hazardous material would be limited to a single building area regardless of the overall size or height of the building. For example, if control areas are not utilized, a 50,000 ft^2 single-story building would be limited to the same quantity of hazardous materials as a two-story building with 5,000 ft^2 per floor.

Buildings of Type IIA, IIIA, and VA construction are required to have floor construction with a minimum fire-resistance rating of 1-hour as indicated in IBC table 601. The exception recognizes the combination of a 1-hour horizontal assembly in conjunction with sprinkler protection as a reasonable alternative for the noted construction types. The three-story limitation is consistent with the fire-resistance rating requirements for fire barriers in IBC Table 414.2.2.

ATTACHMENT D – CONTROL AREA GUIDANCE (cont.)

Figure D-2. Control Areas.