NIST National Institute of Standards and Technology • U.S. Department of Commerce

FIRE PROTECTION & LIFE SAFETY FOR DESIGN AND CONSTRUCTION

NIST S 7401.01
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1. PURPOSE

The purpose of this suborder is to provide the requirements for fire protection and life safety for new construction and additions or alterations to existing buildings. The codes and standards adopted within this suborder are the baseline fire and life safety standards for design and construction that will be enforced on all NIST-owned and operated sites. Where applicable, the suborder specifies changes to, additions to, and adoptions of more stringent codes and standards.

The minimum fire and life safety requirements within the adopted codes and standards are wholly focused on the reduction or elimination of injuries and deaths related to fire. Property protection is a secondary benefit in some cases, however, it is not the focus or primary goal in most of the design standards referenced within the suborder. In cases where equipment is irreplaceable or the benefit-cost ratio is high, consideration should be given to other types of protection (e.g., early detection or specialty suppression systems) which go beyond the minimum requirements of the suborder.

2. BACKGROUND

a. NIST Policy (P) 7400.00, *Fire and Life* Safety, articulates NIST's commitment to making fire and life safety an integral core value and vital part of the NIST culture, in part by complying with applicable laws, regulations, and other promulgated fire and life safety requirements.

[1] For revision history, see Appendix A.

b. NIST Order (O) 7401.00, *Fire and Life Safety*, details the duties and powers of the NIST Authority Having Jurisdiction (AHJ)[2] with respect to fire protection and life safety requirements for new construction and additions or alterations to existing buildings.

3. APPLICABILITY

The provisions of this suborder apply to all new construction and to additions and alterations of existing buildings involving modifications to one or more of the following:

a. Fire alarm system components;

b. Fire suppression system components;

c. Fire-rated construction and smoke control features;

d. Means of egress components (e.g., exit signs, emergency lighting, travel paths, travel distance, etc.); or

e. Occupant loading or use and occupancy classification.

In existing buildings, the following table in accordance with the IEBC shall be referenced for determination of IEBC classification and if a NIST AHJ review is required:

IEBC CLASSIFICATION	DEFINITION EXAMPLES	NIST-AHJ REVIEW & Work Permit
Repairs	The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage. Repairs include the patching or restoration or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition with respect to existing loads or performance requirements.	No
Alteration – Level 1	Alterations include the removal and replacement or the covering of existing materials, elements, equipment, or fixtures using new materials,	No

[2] As detailed in Section 10, the NIST AHJ may delegate the authority to carry out any AHJ responsibilities to other Fire Protection Engineers (FPEs) in the Office of Safety, Health, and Environment (OSHE).

IEBC CLASSIFICATION	DEFINITION EXAMPLES	NIST-AHJ REVIEW & Work Permit
	elements, equipment or fixtures that serve the same purpose.	
Alteration – Level 2	Alterations include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.	Yes
Alteration – Level 3	Alterations where the work area exceeds 50% of the building area.	Yes
Change of Occupancy	A change in the use of the building or a portion of a building. A change of occupancy shall include any change of occupancy classification, any change from one group to another group within an occupancy classification or any change in use within a group for a specific occupancy classification.	Yes
Additions	An extension or increase in floor area, number of stories, or height of a building or structure.	Yes

4. REFERENCES

a. 29 Code of Federal Regulations (CFR) Part 1910. Subpart L, Fire Protection

b. 29 CFR Part 1926, Subpart F, Fire Protection and Prevention

c. American Glovebox Society (AGS) *Guideline for Gloveboxes*

d. AGS *Standard of Practice for Glovebox Fire Protection*

e. American National Standards Institute (ANSI) A117.1, *Standard for Accessible and Usable Buildings and Building*

f. Division 21,[3] *Fire Suppression Specifications*

[3] Divisions refer to divisions of construction information, as defined by the Construction Specifications Institute (CSI)'s MasterFormat. This is the most widely used standard for organizing specifications and other written information for commercial and institutional building projects in the United States.

g. Division 28,[4] *Electronic Safety and Security Specifications*

h. Factory Mutual (FM) Data Sheet 1-53, Anechoic Chambers, April 2012 edition

i. FM Data Sheet 1-56, Cleanrooms

j. Federal Fire Prevention and Control Act of 1974

k. International Building Code (IBC), 2015 edition

l. International Existing Building Code (IEBC), 2015 edition

m. International Fire Code (IFC), 2015 edition

n. International Mechanical Code (IMC), 2015 edition

o. NFPA 3, *Recommended Practice for Commissioning of Fire Protection and Life Safety Systems*, 2015 edition

p. NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*, 2015 edition

q. National Fire Protection Association (NFPA) 10, *Standard for Portable Fire Extinguishers,* 2013 edition

r. NFPA 11, *Low, Medium, and High-Expansion Foam*, 2010 edition

s. NFPA 12, *Standard for Carbon Dioxide Extinguishing Systems*, 2011 edition

t. NFPA 13, *Standard for Installation of Sprinkler Systems,* 2013 edition

u. NFPA 14, *Standard for Installation of Standpipe and Hose Systems,* 2013 edition

v. NFPA 15, *Water Spray Fixed Systems for Fire Protection*, 2012 edition

w. NFPA 16, *Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*, 2011 edition

x. NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, 2013 edition

[4] Ibid.

y. NFPA 17A, *Wet Chemical Extinguishing Systems*, 2013 edition

z. NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* 2011 edition

aa. NFPA 70, *National Electrical Code*, 2014 edition

bb. NFPA 72, *National Fire Alarm and Signaling Code,* 2013 edition

cc. NFPA 75, *Standard for Fire Protection of Information Technology Equipment,* 2013 edition

dd. NFPA 80, *Fire Doors and Fire Windows,* 2013 edition

ee. NFPA 101, *Life Safety Code,* 2015 edition

ff. NFPA 110, *Standard for Emergency and Standby Power Systems*, 2013 edition

gg. NFPA 115, *Standard for Laser Fire Protection,* 2012 edition

hh. NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, 2010 edition

ii. NFPA 318, *Standard for the Protection of Semiconductor Facilities*, 2015 edition

jj. NFPA 750, *Water Mist Fire Protection Systems*, 2015 edition

kk. NFPA 801, *Standard for Fire Protection of Facilities Handling Radioactive Materials,* 2014 edition

ll. NFPA 2001, *Clean Agent Fire Extinguishing Systems*, 2012 edition

5. APPLICABLE NIST DIRECTIVES

a. NIST P 7400.00: *Fire and Life Safety*

b. NIST O 7401.00: *Fire and Life Safety*

c. NIST S 7401.02: *Inspection, Testing, and Maintenance of Fire Protection and Life Safety Systems*

d. NIST S 7401.03: *Impairment of Fire Protection and Life Safety Systems*

e. NIST S 7401.04: *Fire Prevention During Welding, Cutting and Other Hot Works*

f. NIST S 7101.60: *Chemical Management*

g. NIST S 7101.72: *Laser Safety*

6. REQUIREMENTS

a. Design and Construction Criteria

(1) NIST shall adopt the following codes and standards as baseline fire and life safety requirements for design and construction activities[5]:

(a) The 2015 International Code Council (ICC) suite of codes, including the IBC, IEBC, IFC, and IMC;

(b) The reference standards within the ICC suite of codes; and the referenced standards listed in Section 4 of this document.

(2) For existing NIST buildings undergoing additions or alteration, the following shall be adhered to:

(a) IEBC; and

(b) Federal Fire Prevention and Control Act of 1974

(3) For Request for Variance (RFV) and Appeal of Denied Request

(a) See NIST O7401-00 Fire & Life Safety and Appendices E and F.

(4) The following requirements are in addition to the adopted codes and standards listed in Section 6a(1), or are provided for additional clarity or emphasis.

(a) Building Design and General Fire and Life Safety Features

i. Type of construction, fire resistance requirements, penetrations, allowable floor area, building height limitations, building separation distance requirements, and allowable fire areas shall be in accordance with the IBC.

[5] A list of additional adopted codes and standards, to include those standards not referenced in this suborder but referenced in other FLS suborders, is provided in NIST O7401.00: Fire and Life Safety, Appendix B.

(i) Existing metal walls found in the NIST lab buildings are acceptable for reconfiguration within the limits of the adopted codes and standards.

ii. Means of egress requirements shall comply with IBC, Chapter 10 and NFPA 101[6], *Life Safety Code*, for new and existing buildings.

iii. Door openings in fire resistive construction shall be protected in accordance with NFPA 80, *Fire Doors and Fire Windows*.

(i) Approved fire doors and their frames shall not be modified in the field.

b. Fire Suppression Systems

(1) Any new fire suppression system or any alteration to an existing fire suppression system shall require a NIST Work Permit.

(2) All new construction shall have complete automatic sprinkler protection designed and installed in accordance with the IBC and NFPA 13, *Standard for the Installation of Sprinkler Systems*. The requirements for the installation of automatic sprinkler protection in existing buildings undergoing renovations shall be in accordance with the IEBC.

(a) Automatic sprinkler systems shall use equipment and devices listed by a Nationally Recognized Testing Laboratory (a.k.a. "NRTL"), and shall be acceptable per the NIST AHJ.

(b) Automatic sprinkler systems shall provide for 100% coverage of the building, unless otherwise permitted within NFPA 13.

i. NIST buildings/areas deemed sensitive to water damage or areas with irreplaceable equipment may be evaluated by the NIST AHJ for an exception to the 100% fire sprinkler requirement by the NIST AHJ. However, an alternative means for fire protection and life safety shall be provided.

(c) Backflow preventers shall be installed on all new systems in accordance with NFPA 13 and manufacturer requirements. Hydraulic calculations shall include pressure

[6] The requirements within Chapter 10 of the IBC supersede those requirements within NFPA 101 to the extent that the two codes conflict. In instances where additional requirements are provided within NFPA 101 that are not present in Chapter 10 of the IBC, those requirements shall be implemented unless otherwise deemed unnecessary by the NIST AHJ.

losses for backflow preventers, per manufacturer data sheets or a minimum of 5 PSI, whichever is greater.

(d) Fire sprinkler systems shall be designed using the Area/Density method from NFPA 13.

(e) Fire sprinkler piping shall be designed and installed in accordance with NFPA 13 and with the following NIST requirements:

i. All fire sprinkler piping shall be Schedule 40 for sizes of 6 inches and smaller;

ii. Fire sprinkler piping 6 inches or more may be exempt from the Schedule 40 requirements with prior NIST AHJ approval; and

iii. Incoming fire sprinkler feeds shall be dedicated and provided with a locked post indicator valve.

(f) Hydraulic calculations shall include a minimum 10% factor of safety for residual pressure.

(g) Shop drawings and calculations (when required) for new fire suppression systems or altered fire suppression systems shall be prepared by one of the following:

i. National Institute for Certification in Engineering Technologies (NICET) Level III for Automatic Sprinkler Systems;

ii. NICET Level IV for Special Hazards Suppression Systems; or

iii. A registered FPE.

(h) Fire suppression systems shall be designed, fabricated, and installed by a qualified person[7].

(i) All fire suppression systems shall be monitored unless otherwise permitted by the NIST AHJ.

[7] The term "qualified" is defined in the NFPA Glossary of Terms as "A competent and capable person or company that has met the requirements and training for a given field acceptable to the authority having jurisdiction." The term "qualified person" is defined in the NFPA Glossary of Terms as "A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to perform the work."

(3) For water-based fire protection systems, water flow tests shall be conducted in accordance with NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants,* to determine the available water supply.

(a) The water flow test shall be witnessed by the NIST AHJ.

(b) Historical water supply information may be presented for reference, but it shall not be accepted as input information for new or modified water-based fire protection systems.

(4) Standpipe systems shall be designed and installed in accordance with NFPA 14, *Installation of Standpipe and Hose Systems.*

(a) Class II and III standpipe systems are not permitted at NIST-owned and operated sites.

(5) Water spray systems shall be designed and installed in accordance with NFPA 15, *Water Spray Fixed Systems for Fire Protection.*

(6) Water mist systems shall be designed and installed in accordance with NFPA 750, *Water Mist Fire Protection Systems.*

(7) Foam systems shall be designed and installed in accordance with NFPA 11, *Low, Medium, and High-Expansion Foam*, and NFPA 16, *Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.*

(8) Dry chemical extinguishing systems shall be designed and installed in accordance with NFPA 17, *Dry Chemical Extinguishing Systems.*

(9) Carbon dioxide systems shall be designed and installed in accordance with NFPA 12, *Carbon Dioxide Extinguishing Systems.*

(a) Total flooding systems are not allowed in normally occupied spaces, *i.e.*, in areas where a pipe break/leak could make a normally occupied area unsafe for occupants.

(10) Wet chemical extinguishing systems shall be designed and installed in accordance with NFPA 17A, *Wet Chemical Extinguishing Systems.*

(11) Wetting agent fire extinguishing systems and water additive fire controls shall be designed and installed in accordance with NFPA 18, *Wetting Agents*, and NFPA 18A, *Water Additives for Fire Control*

(12) Clean agent fire extinguishing systems shall be designed and installed in accordance with NFPA 2001, *Clean Agent Fire Extinguishing Systems.*

(a) With total flooding and local application clean agent systems, consideration shall be given to compartment under/over pressurization that could occur during discharge.

(13) Portable fire extinguishers shall be designed and installed in accordance with NFPA 45; *Standard on Fire Protection for Laboratories using Chemicals*, NFPA 101, *Life Safety Code*, and NFPA 10, *Portable Fire Extinguishers*.

(a) Fire extinguishers may be installed in recessed or semi-recessed enclosed cabinets. If necessary due to building restrictions, fire extinguishers may be placed on hooks without reducing egress widths beyond acceptable limits.

(14) Halon 1301 systems are prohibited at NIST-owned and operated sites.

c. Fire Detection Systems

(1) Any new fire detection system or alteration to an existing fire detection system shall require a NIST Work Permit.

(2) Fire alarm systems shall be designed and installed in accordance with NFPA 72, *National Fire Alarm Code*, and NFPA 70, *National Electric Code.*

(3) Duct smoke detectors

(a) New and existing building construction requirements for duct smoke detectors shall comply with the IMC.

(b) Duct detector bypass capabilities shall be provided at the fire alarm control panel (FACP) to allow for exhausting of smoke via the AHU(s).

(4) Fire alarm system shop drawings and calculations (when required) shall be prepared by one of the following:

(a) NICET Level III for Fire Alarm Systems; or

(b) A registered FPE.

(5) Fire alarm shop drawings and calculations (when required) shall satisfy the following requirements:

(a) Voltage drop calculations shall be limited to a 10% voltage drop; and

(b) Actual circuit lengths shall be utilized; and

(c) Battery calculations shall provide a minimum safety factor of 20%; and

(d) Batteries size shall be limited to 55 amp-hours. If calculations plus safety factor require larger batteries, then multiple 55 amp-hour batteries will be provided, unless otherwise approved by the NIST AHJ; and

(e) Battery shall be sized to provide a minimum of 36 hours of stand-by and 15 minutes of alarm for Gaithersburg and 24 hours of stand-by and 15 minutes of alarm for Boulder.

(6) Fire alarm systems shall be designed, fabricated, and installed by a qualified person[8].

(7) All fire alarm systems shall be monitored unless otherwise permitted by the NIST AHJ

(8) Fire Alarm System Components/Devices.

(a) The NIST fire alarm system shall be:

i. Compatible with the Simplex brand on the Gaithersburg campus; or

ii. Compatible with the Notifier brand on the Boulder campus.

(b) The NIST fire alarm systems shall be independent and stand-alone systems that are not dependent on security systems, energy monitoring and control systems, or any other systems.

[8] The term "qualified" is defined in the NFPA Glossary of Terms as "A competent and capable person or company that has met the requirements and training for a given field acceptable to the authority having jurisdiction." The term "qualified person" is defined in the NFPA Glossary of Terms as "A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to perform the work."

i. A fire alarm system may be combined with a building mass notification system or with a combination building mass notification and public-address system.

(c) The NIST fire alarm systems may be connected to security systems for monitoring purposes only, but shall not rely on any components of the security system for operation.

(d) The NIST fire alarm system shall not be utilized to perform functions unrelated to fire and life safety, e.g. building automation and/or mechanical and electrical system monitoring.

(e) Audio/Visual (AV) devices may be either wall or ceiling mounted devices, and shall be selectable for 15/30/75/110 candela rating/s.

(f) Wireless interior fire alarm systems are not allowed at NIST-owned and operated sites without written approval of NIST AHJ.

(g) Fire Alarm System Circuitry.

i. NIST fire alarm circuits shall be Class A on the Gaithersburg campus. Class B circuitry is acceptable on the Boulder campus.

ii. No T-taps are allowed.

iii. Minimum wire gauge is 14.

iv. All fire alarm circuits shall be in conduit.

(i) Conduits filling shall conform to conduit fill requirements of NFPA 70, *National Electrical Code*.

(9) The NIST fire alarm system shall report the following fire events/occurrences as follows:

(a) Manual pull stations shall transmit a fire alarm signal to the NIST monitoring system. The building notification devices shall be activated.

(b) Water flow switches (where present) shall transmit a fire alarm signal to the NIST monitoring system. The building notification devices shall be activated.

(c) Heat, smoke, flame (IR), and beam detectors shall transmit a fire alarm signal to the NIST monitoring system. The building notification devices shall be activated.

i. Exception: Detectors located in compartmented, fire-rated mechanical rooms shall transmit a supervisory signal to the NIST monitoring system.

(d) Duct smoke detectors shall transmit a supervisory signal to the NIST monitoring system. The respective air-handling unit (AHU) shall automatically shut down.

(e) Tamper switches shall transmit a supervisory signal to the NIST monitoring system.

(f) Local dedicated system control panels shall be monitored for alarm, supervisory, and trouble signals, which shall be transmitted to the NIST monitoring system unless deemed unnecessary by the NIST AHJ.

i. The NIST AHJ shall have final decision over how specific actions from local control panels are transmitted to the NIST monitoring system.

d. Special Occupancies & Hazards

(1) Laboratories Using Chemicals

(a) All laboratory buildings, laboratory units, and laboratory work areas shall be constructed and protected in accordance with NFPA 45, *Fire Protection for Laboratories Using Chemicals*.

(2) Data/Server Rooms

(a) Electronic equipment rooms shall be constructed and protected in accordance with IBC; NFPA 75, *Protection of Information Technology Equipment*; and NFPA 70, *National Electric Code*.

i. These areas include, but are not limited to, automatic data processing areas (data/server rooms), communication centers, and battery rooms.

ii. Incidental electronic equipment including, but not limited to, printers, desk top computers, office automation systems, individual computer work stations, telephones, video conference rooms, administration telephone rooms, and reproduction equipment would not be required to comply with this section.

(3) Battery Rooms

(a) Battery rooms shall be constructed and protected in accordance with NFPA 70, *National Electric Code*.

(4) Anechoic Chambers

(a) FM Global Data Sheet 1-53, *Anechoic Chambers*, should be consulted for design guidance.

(b) Anechoic chambers shall be protected by either a water based sprinkler system in accordance with NFPA 13, or a clean agent system in accordance with NFPA 2001.

(c) Anechoic chambers construction shall use only noncombustible materials for structure, wall, floor, and ceiling panels.

(d) Fire suppression systems shall be controlled by dedicated U.L. listed control valve assembly.

(e) Anechoic chambers shall be equipped with dedicated high sensitivity smoke detection (HSSD) system.

i. New anechoic chambers may be protected by expansion of an existing HSSD system with prior approval from NIST AHJ.

(f) Power shall be shunted to the anechoic chambers, and all equipment within the chamber, upon activation of fire suppression or detection system.

(5) Laser laboratories which are capable of producing beam ignition hazards and which utilize materials or components presenting a fire hazard shall be constructed and protected in accordance with NFPA 115, *Standard for Laser Fire Protection.*

(6) Clean rooms shall be constructed and protected in accordance with FM Global Data Sheet 1-56, unless otherwise approved by the NIST AHJ, where applicable, NFPA 318, *Standard for the Protection of Semiconductor Facilities* and IFC Chapter 27

(a) Clean rooms shall be protected by a complete fixed-based extinguishing system, designed and installed in accordance with one of the nationally recognized standards listed in Section 4.

(b) Where airflow within the cleanroom is such that buoyant drive flows will be disrupted, such as in the case of downward air flow or high flow velocities, an evaluation must be performed to determine if standard ceiling mounted detection will provide adequate protection or an alternative detection mechanism, e.g., very early smoke detection apparatus (a.k.a. "VESDA"), shall be provided.

(7) Environmental chambers, such as temperature and humidity controlled enclosures used for testing electronics, biological materials, or other industrial products, shall be protected by a complete fixed-based extinguishing system, designed and installed in accordance with one of the nationally recognized standards listed in Section 4.

(a) Where the chamber is composed of non-combustible materials[9] and is not contained within a building protected by sprinklers, fixed fire suppression may not be required.

i. Chambers shall be equipped with an approved detection system if a fixed fire suppression system is not utilized to protect the chamber.

ii. Electrical shunting shall be coupled with fire detection.

(b) Fire suppression and detection systems should be designed and installed to withstand the range of environmental conditions that may be present in the chamber.

(c) Combustible gas detection and carbon monoxide detection equipped with a local alarm shall be provided in the chamber where heat is provided by a gas-powered furnace.

(8) Gloveboxes shall be protected in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* AGS *Guideline for Gloveboxes*, and AGS *Standard of Practice for Glovebox Fire Protection.*

(a) Where radioactive materials are utilized within gloveboxes, the requirements within NFPA 801, *Standard for Fire Protection of Facilities Handling Radioactive Materials,* shall also apply.

[9] The NFPA glossary of terms defined a "noncombustible material" as "a material that, 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. Materials that are reported as passing ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C, shall be considered noncombustible materials."

e. Statements of Work (SOW's)

(1) All SOWs involving NIST activities subject to the requirements of this suborder (see Section 3. APPLICABILITY), whether for external or internal work, shall specify compliance with:

(a) NIST adopted codes, standards, amendments;

(b) Other NIST Fire and Life Safety suborder requirements; and

f. A/E Design and Construction Submittals

(1) A/E firms shall provide design submittal packages, as defined below, for 35%, 65%, and 95%.

(a) Requirements for the design submittal phases may be altered with approval from the NIST AHJ for both design-bid-build and design-build projects.

(b) The NIST AHJ shall review design submittals within the period designated in the contract.

(c) All open comments shall be addressed prior to 100%/Issue for Construction (IFC) Set being issued to NIST AHJ office. The IFC set shall be submitted to the NIST AHJ office prior to start of construction.

(2) 35% Basis of Design Narrative Submittal Package.

(a) Building Code Submittal Package (35%)

i. Project Summary;

ii. Applicable codes/standards with referenced editions;

iii. Occupancy classification;

iv. Building construction type;

v. Building height and allowable area calculations;

vi. Building separation distances if applicable; and

vii. Occupancy separations.

(b) Fire Alarm Submittal Package (35%)

i. Preliminary design specifications from Division 28.

ii. One (1) preliminary half-size drawing set with the following at a minimum:

(i) General design & installation notes;

(ii) Fire alarm zones; and

(iii) Preliminary device layout.

(c) Fire Suppression Submittal Package (35%)

i. Preliminary design specifications from Division 21; and

ii. One (1) preliminary half-size drawing set with the following at a minimum:

(i) General design & installation notes;

(ii) Flow test data, not to be over 12 months old from the time of submission;

(iii) Fire suppression zones;

(iv) Hazard classifications identified per NFPA 13, *Standard for Installation of Sprinkler Systems*; and

(v) Preliminary hydraulic calculations to determine if a fire pump will be required.

(d) Life Safety Submittal Package (35%)

i. One (1) half-size drawing set with the following at a minimum:

(i) Occupant load factors and calculated occupant loads;

(ii) Maximum travel distance(s);

(iii) Common path(s) of travel;

(iv) Maximum dead-end travel;

(v) Exit remoteness measurements;

(vi) Required wall ratings; and

(vii) Exit capacity.

(3) 65% Design Submittal

(a) Building Code Submittal Package (65%)

i. All 35% comments addressed with revision clouds and notes referencing appropriate comments; and

ii. Updated basis of design narrative.

(b) Fire Alarm Submittal Package (65%)

i. All 35% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Updated design specifications from Division 28; and

iii. One (1) updated half-size drawing set with the following at a minimum:

(i) General design & installation notes;

(ii) Fire alarm zones;

(iii) Updated device layout;

(iv) Sequence of operations;

(v) Riser diagram; and

(vi) Installation details.

(c) Fire Suppression Submittal Package (65%)

i. All 35% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Updated design specifications from Division 21; and

iii. One (1) updated half-size drawing set with the following at a minimum:

(i) General design and installation notes;

(ii) Flow test data, not to be over 12 months old from the time of submission;

(iii) Fire suppression zones;

(iv) Fire suppression main sizes and locations;

(v) Fire suppression riser sizes and locations;

(vi) Fire suppression valve details;

(vii) Fire department connection locations and details;

(viii) Post indicator valve locations and details;

(ix) Fire suppression incoming size and location;

(x) Hazard classifications identified per NFPA 13, *Standard for Installation of Sprinkler Systems*;

(xi) Detailed hydraulic calculations done with NIST AHJ approved software; and

(xii) Manufacturer Product Data Sheets (design-build only).

(d) Life Safety Submittal Package (65%)

i. All 35% comments addressed with revision clouds and notes referencing appropriate comments.

ii. One (1) updated half-size drawing set with the following at a minimum:

(i) Occupant load factors and calculated occupant loads;

(ii) Maximum travel distance(s);

(iii) Common path(s) of travel;

(iv) Maximum dead-end travel;

(v) Exit remoteness measurements;

(vi) Required wall ratings; and

(vii) Exit capacity.

(4) 95% Design Submittal

(a) Building Code Submittal Package (95%)

i. All 65% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Final basis of design narrative; and

iii. Manufacturer Product Data for Penetrations and Underwriters Laboratory (a.k.a. "UL") Listed Assemblies (Design-Build only).

(b) Fire Alarm Submittal Package (95%)

i. All 65% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Final design specifications from Division 28; and

iii. One (1) final half-size drawing set with the following at a minimum:

(i) General design and installation notes;

(ii) Fire alarm zones;

(iii) Updated device layout;

(iv) Sequence of operations;

(v) Riser diagrams;

(vi) Installation details;

(vii) Battery and voltage calculations (design-build only); and

(viii) Manufacturer Product Data Sheets (design-build only).

(c) Fire Suppression Submittal Package (95%)

i. All 65% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Final design specifications from Division 21; and

iii. One (1) final half-size drawing set with the following at a minimum:

(i) General design and installation notes;

(ii) Flow test data, not to be over 12 months old from the time of submission;

(iii) Fire suppression zones;

(iv) Fire suppression main sizes and locations;

(v) Fire suppression riser sizes and locations;

(vi) Fire suppression valve details;

(vii) Fire department connection locations and details;

(viii) Post indicator valve locations and details;

(ix) Fire suppression incoming size and location;

(x) Hazard classifications identified per NFPA 13, *Standard for Installation of Sprinkler Systems*;

(xi) Updated detailed hydraulic calculations done with NIST AHJ approved software; and

(xii) Updated manufacturer Product Data Sheets (design-build only).

(d) Life Safety Submittal Package (95%)

i. All 65% comments addressed with revision clouds and notes referencing appropriate comments;

ii. Final building code summary; and

iii. One (1) final half-size drawing set with the following at a minimum:

(i) Occupant loads and occupant load factors;

(ii) Maximum travel distance(s);

(iii) Common path(s) of travel;

(iv) Maximum dead-end travel;

(v) Exit remoteness measurements;

(vi) Required wall ratings; and

(vii) Exit capacity.

(5) 100%/IFC Set

(a) Building Code Submittal Package (100%)

i. All previous comments addressed and closed out; and

ii. All revision clouds and notes referencing appropriate comments deleted.

(b) Fire Alarm Submittal Package (100%/IFC Set)

i. All previous comments addressed and closed out;

ii. All revision clouds and notes referencing appropriate comments deleted;

iii. Final design specifications from Division 28; and

iv. One (1) final half-size drawing set.

(c) Fire Suppression Submittal Package (100%/IFC Set)

i. All previous comments addressed and closed out;

ii. All revision clouds and notes referencing appropriate comments deleted;

iii. Final design specifications from Division 21; and

iv. One (1) final half-size drawing set.

(d) Life Safety Submittal Package (100%/IFC Set)

i. All previous comments addressed and closed out; and

ii. All revision clouds and notes referencing appropriate comments deleted.

(6) Construction Submittals

(a) Fire Alarm

i. Submittals shall be in accordance with approved Division 28 specifications.

(b) Fire Suppression

i. Submittals shall be in accordance with approved Division 21 specifications.

g. OFPM Work Order Submittals

(1) OFPM shall submit work orders to the NIST AHJ for review in accordance with Section 3 (Applicability) of this suborder.

(a) It is the obligation of the organization performing the work to ensure compliance with the requirements of this suborder and to ensure that a NIST Work Permit is obtained when required. If there is any uncertainty regarding the requirements for a permit, the organization performing the work shall consult with the NIST AHJ.

(2) All work orders shall contain the following information:

(a) Building and room number;

(b) OU Point of Contact

(c) Description of work;

(d) Work area plans and/or sketch; and

(e) OFPM contact name and contact information.

h. OU-Managed Projects

(1) All contracts that involve work in accordance with Section 3 (Applicability) of this suborder shall by reviewed by the NIST AHJ.

(a) It is the obligation of the organization performing the work to ensure compliance with the requirements of this suborder and to ensure that a NIST Work Permit is obtained when required. If there is any uncertainty regarding the requirements for a permit, the organization performing the work shall consult with the NIST AHJ. (b) All submittals from contractors shall follow the applicable requirements set forth in Section 6e and 6f.

(2) All projects executed in-house, e.g. design and construction work performed by NIST staff, that involve work in accordance with Section 3 (Applicability) of this suborder shall be reviewed by the NIST AHJ.

(a) It is the obligation of the organization performing the work to ensure compliance with the requirements of this suborder and to ensure that a NIST Work Permit is obtained when required. If there is any uncertainty regarding the requirements for a permit, the organization performing the work shall consult with the NIST AHJ.

(b) All submittals for projects executed in-house shall contain the following information:

i. Building and room number;

ii. Statement of work per Section 6b;

iii. Work area plans and/or sketch, which when required by the NIST AHJ, shall be reviewed and approved by a licensed professional engineer or other qualified person;

iv. Information on the individual(s) performing the specific work required:

(i) Name;

(ii) Training required to perform that work; and

(iii) When required by the NIST AHJ, certifications indicating that the individuals are competent to perform the work.

v. OU contact name and contact information.

i. NIST Work Permit

(1) Work involving New construction and additions or alterations to existing buildings shall not commence until a NIST Work Permit, when required, has been issued by the NIST AHJ

(2) The NIST AHJ shall issue a NIST Work Permit subsequent to:

(a) Signing the 100% drawings and documents related to A/E firm design submittals; and

i. The issuance of a NIST Work Permit prior to 100% drawing acceptance may be approved by the NIST AHJ for design-build projects.

(b) Approving the OFPM work order submittal; or

(c) Approving the OU-managed project submittal.

(3) The NIST Work Permit shall contain the following information (see Appendix B):

(a) Location where the work will be performed (*e.g.*, specific location on campus or building and room number);

(b) Description of work;

(c) Work permit expiration date;[10]

(d) Signature of the NIST AHJ; and

(e) Name and contact information for the Contracting Officer's Representative and for the OFPM, or OU contact, whichever is applicable.

(3) Audits

(a) The NIST AHJ shall perform, at minimum, an annual audit of all NIST 260 forms submitted to OFPM to ensure compliance with the requirements of this suborder.

(b) Failure to obtain a work permit, when required, may result in a Stop Work Order (see NIST S 7101.03), revocation of a Use and Occupancy Certificate (see below), or delay in issuance of a Use and Occupancy Certificate.

j. Construction Phase

(1) All NIST Work Permits shall be prominently posted on the job site for the duration of work being performed.

(2) All requests for information (a.k.a. "RFIs") involving work in accordance with Sections 3a-e (Applicability) of this suborder shall be submitted to the NIST AHJ in hard-copy or electronic format.

(3) Inspections of fire and life safety construction activities shall be performed or witnessed by the NIST AHJ prior to close-ins.

(a) The NIST AHJ shall be notified at least two (2) weeks prior to the requested inspection date.

(b) Shorter notification periods are acceptable for projects lasting less than 30 days.

[10] The expiration date for the work permit shall be coordinated with the project manager.

(c) A third party qualified company may perform inspections of fire and life safety construction activities with prior approval by the NIST AHJ.

(4) Acceptance Testing

(a) Shall be in accordance with NFPA 3, *Recommended Practice for Commissioning of Fire Protection and Life Safety Systems*.

(b) Shall be in accordance with NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*.

(c) All fire alarm and fire suppression systems shall be acceptance tested per NFPA 72, *National Fire Alarm and Signaling Code,* and NFPA 13, *Standard for Installation of Sprinkler Systems*, respectively.

(d) Pre-testing documentation shall be provided to the NIST AHJ at least one (1) week prior to scheduling final acceptance testing.

i. Shorter notification periods are acceptable for projects lasting less than 30 days.

(e) The NIST AHJ shall be notified at least two (2) weeks prior to the requested final acceptance testing date.

i. Shorter notification periods are acceptable for projects lasting less than 30 days.

(f) Where feasible, acceptance testing shall be conducted during normal business hours (8:00 am to 5:00 pm), Monday through Friday.

k. Use and Occupancy (U&O) Certificates

(1) U&O certificates shall be issued by the NIST AHJ prior to occupancy of any newly constructed building, occupancy of an addition of an existing building, or change in occupancy of an altered space in an existing building.

(a) U&O certificates shall be maintained in the possession of the OU responsible for the space.

(2) The NIST AHJ shall issue U&O certificates subsequent to being provided with the following:

(a) Final inspection report(s) for fire and life safety systems and/or components as conducted by NIST AHJ or approved third party company; and

(b) Acceptance testing(s) documents in accordance with NFPA 3, 13, and 72.

(3) The U&O certificate shall indicate the following, where applicable (see Appendix C):

(a) Certificate number;

(b) Date of issue;

(c) Use & occupancy classification;

i. Laboratory classification, as defined in NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*; and

(d) Building and room number(s).

(4) Temporary U&O certificate shall indicate the following, where applicable (see Appendix D):

(a) Date of issue;

(b) Use & occupancy classification;

(c) Deficiencies requiring correction prior to final U&O issuance.

(d) Building and room number(s); and

(e) Date of expiration.

(5) Existing spaces not undergoing alterations shall be grandfathered from the requirement for a U&O certificate until such time that the space is inspected by the NIST AHJ.

7. DEFINITIONS

a. Acceptable – Considered by the NIST AHJ as adequate for satisfying the goals, performance objectives, and/or performance criteria.

b. Acting Authority Having Jurisdiction – A qualified[11] FPE in the Office of Safety, Health, and Environment (OSHE) designated by the CSO to be temporarily assigned all authorities, duties, and obligations of the NIST AHJ during the NIST AHJ's absence or in the event of position vacancy.

c. Addition – An extension or increase in floor area, number of stories, or height of a building or structure.

d. Alteration – Any construction or renovation to an existing structure other than repair or addition. This would also include a change of occupancy.

e. Anechoic Chamber – Any space designed and constructed to absorb sound or electromagnetic wave reflections.

f. Appeal – A process by which a Division Chief or equivalent, or a higher-level manager, requests that the NIST CSO review a denial or rejection of an RFV by the NIST AHJ.

g. Authority Having Jurisdiction – A qualified FPE[12] in OSHE designated by the NIST CSO to enforce[13] the NIST-adopted codes and standards relevant to fire, electrical, and life safety on NIST-owned and operated sites.

h. Change of Occupancy – A change in the purpose or level of activity within a building that involves a change in application of the requirements of this suborder, *e.g.*, modifying a laboratory space to an office space.

i. Compliance – Meeting or exceeding all applicable requirements of the NIST adopted code(s) and standard(s).

j. Delegated Authority Having Jurisdiction – A qualified engineer in OSHE designated by the NIST AHJ to enforce the NIST-adopted codes and standards that fall within their relevant discipline(s).

[11] See requirements for Office of Personnel Management Fire Protection Engineering Series 0804.
[12] See requirements for Office of Personnel Management Fire Protection Engineering Series 0804.

[13] Nature of enforcement is dependent upon the severity of the violation, e.g. stop work order, revocation of work permit, denial of use and occupancy, etc.

k. Equivalency – A proposed alternative means of providing an equal or greater degree of safety than that afforded by strict conformance to prescribed codes and standards.

l. Existing Building – A building erected prior to the adoption of the appropriate code, or one for which a NIST Work Permit has been issued.

m. NIST Work Permit – A document issued by the NIST AHJ which indicates approval to begin work in a building or tenant space where alterations to fire, or life safety components will be performed/managed by OFPM, OU, or a contractor.

n. Performance-Based Approach – An approach that relies upon measurable (or calculable) outcomes to be met but provides more flexibility as to the means of meeting those outcomes.

o. Repair – The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

p. Shall/Should/May –

- Shall (Must or Will): Indicates that the performance of an item is mandatory.
- Should: Indicates that the performance of an item is not mandatory, but the full implications of not performing that item must be understood and either justified or carefully weighed before choosing a different course.
- May: Indicates that the performance of an item is at the discretion of the individual responsible for the action.

q. Use and Occupancy Certificate – A document issued by the NIST AHJ certifying that the building or space is compliant with the NIST adopted codes and standards.

r. Variance – An equivalency or an exception (i.e. modification) from the code and/or suborder requirement(s).

8. ACRONYMS

a. A&E – Architectural/Engineering

b. AGS – American Glovebox Society

c. AHJ – Authority Having Jurisdiction

d. ANSI – American National Standards Institute

e. CFR – Code of Federal Regulations

f. CSO – Chief Safety Officer

g. FM – Factory Mutual

h. FPE – Fire Protection Engineer

i. GPL – General Purpose Lab

j. IBC – International Building Code

k. ICC – International Code Council

l. IEBC – International Existing Building Code

m. IFC – International Fire Code

n. IMC – International Mechanical Code

o. NCEES – National Council of Examiners for Engineering and Surveys

p. NFPA – National Fire Protection Association

q. NICET – National Institute for Certification in Engineering Technologies

r. OFPM – Office of Facility and Property Management

s. OSHA – Occupational Safety and Health Administration

t. PE – Professional Engineer

u. U&O – Use and Occupancy

9. RESPONSIBILITIES

a. NIST AHJ or Delegated AHJ is responsible for:

(1) Reviewing all A/E design submittals, within the timeframes specified in the contracts, to ensure compliance with the adopted fire and life safety codes and standards.

(2) Reviewing all work orders within five (5) business days, and identifying necessary submittal documents.

(3) Reviewing all design and construction documents for OFPM and OU-managed projects to ensure compliance with the adopted fire and life safety codes and standards;

(4) Issuing NIST Work Permits for OFPM and OU-managed projects when required.

(5) Inspecting fire and life safety system components prior to close-ins,

(6) Overseeing acceptance testing of fire protection and life safety systems;

(7) Issuing U&O certificates for newly renovated or newly constructed spaces; and

(8) Inspecting existing, occupied spaces not undergoing alterations and issuing U&O certificates.

b. OU Directors are responsible for:

(1) Ensuring that the requirements of Section 6 of this suborder are met for OU managed project; and

(2) Ensuring that all newly renovated or newly constructed spaces owned by the OUs have a Use and Occupancy certificate prior to occupancy and that Use and Occupancy certificates are readily available upon the request of the NIST AHJ.

(3) For OU-managed projects:

(a) Ensuring that the NIST AHJ is consulted on all new construction, renovations, and alterations of spaces including alteration to fire alarm system components, suppression system components, fire-rated assemblies, life safety and means of egress components (*e.g.*, exit signage, emergency lighting, travel path, travel distance, *etc.*), occupant loading or U&O classification;

(b) When appropriate, submitting design and construction documents to the NIST AHJ for review and approval through all submittal phases;

(c) Ensuring that work is not started without NIST AHJ review to determine if a NIST Work Permit is required; and

(d) Ensuring the NIST Work Permits issued by the NIST AHJ are posted on the site during construction activities.

c. Contracting Officer's Representative/Project Manager is responsible for:

(1) Submitting design and construction documents to the NIST AHJ for review and approval through all submittal phases

(2) Ensuring that the NIST AHJ is consulted on all new construction, renovations, and alterations of spaces including alterations to fire alarm system components, suppression system components, fire-rated assemblies, life safety and means of egress components (e.g. exit signage, emergency lighting, travel path, travel distance, etc.), occupant loading or U&O classification.

(3) Ensuring that work is not started without NIST AHJ review to determine if a NIST Work Permit is required.

(4) Ensuring the NIST Work Permits issued by the NIST AHJ are posted on the site during construction activities.

(5) Ensuring the As-built drawings are submitted by the contractors for project close-out.

d. Chief Facility Maintenance Officer is responsible for:

(1) Ensuring that the requirements of Section 6 of this suborder are met for all A/E and OFPM projects; and

(2) Ensuring As-built drawings for fire systems are managed and updated as needed.

10. AUTHORITIES

a. The NIST Authority Having Jurisdiction may delegate the authority to carry out any AHJ responsibilities to FPEs in the Office of Safety, Health, and Environment.

11. DIRECTIVE OWNER

Chief Safety Officer

12. APPENDICES

A. Revision History

B. NIST Work Permit Form

C. Certificate of Use and Occupancy

D. Temporary U&O Certificate

E. Request for Variance Form

F. Request for Appeal Form

Appendix A. Revision History

Revision No.	Approval Date	Deployment Start Date	Effective Date	Brief Description of Change; Rationale
0	09/30/17	05/01/18	10/01/18	• None – Initial document
1	01/12/21	April Camenisch		• Updated NIST suborder links.

Appendix B. Work Permit Form

NIST-XXX	**U.S. DEPARTMENT OF COMMERCE** NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

NIST WORK PERMIT

OSHE-FFSG

A. PERMIT DETAIL

Permit Number	Building Number	Room Number	Date of Issue	Date of Expiration

B. CONTACT INFORMATION

Name	Phone Number

C. DESCRIPTION OF WORK

D. DECISION

☐ Approved ☐ Not Approved		Comments
Name (Print)	Phone Number	Title Authority Having Jurisdiction (AHJ)
Signature		Date

Appendix C. Certificate of Use and Occupancy

Federal Building Owned by the
National Institute of Standards & Technology
Department of Commerce

Certificate No:	
Permit No:	
Date of Issue:	
Building:	
Room:	
Primary Occupancy Use:	
Contact Name & Title:	
Contact Phone Number:	

This certifies that the above facility conforms to the approved plans on file with the National Institute of Standards and Technology Office of Facilities and Property Management and complies with all building, safety, and fire codes adopted by NIST and required by Federal law and regulations for the use and occupancy designated above as of the date of final inspection and approval.

Title	**Name**	**Signature**	**Date**
Director - OFPM	_____	_____	_____
Division Chief – OFPM, Design & Construction	_____	_____	_____
Authority Having Jurisdiction – OSHE	_____	_____	_____
Group Leader (min.) – OSHE	_____	_____	_____

Appendix D. Temporary Certificate of Use and Occupancy

Federal Building Owned by the
National Institute of Standards & Technology
Department of Commerce

Certificate No:	
Permit No:	
Date of Issue:	
Date of Expiration (If applicable):	
Building:	
Room:	
Primary Occupancy Use:	
Contact Name & Title:	
Contact Phone Number:	
Outstanding Deficiencies:	

This certifies that the above facility conforms to the approved plans on file with the National Institute of Standards and Technology Office of Facilities and Property Management and complies with all building, safety, and fire codes adopted by NIST and required by Federal law and regulations for the use and occupancy designated above as of the date of final inspection and approval.

Title	**Name**	**Signature**	**Date**
Director - OFPM	_____	_____	_____
Division Chief – OFPM, Design & Construction	_____	_____	_____
Authority Having Jurisdiction – OSHE	_____	_____	_____
Group Leader (min.) – OSHE	_____	_____	_____

1293 **Appendix E. Request for Variance Form**

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NIST-XXX	**U.S. DEPARTMENT OF COMMERCE** NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

REQUEST FOR VARIANCE

OSHE-FFSG

A. REQUESTER

Name	Division	Building	Room	Phone

B. PROJECT INFORMATION

Project Title	Work Order Number (If applicable)
Building	**Room**

Description of Variance

Prescriptive Requirement/s from which Variance is Sought

Alternative Means for Prescriptive Requirement

D. TO BE COMPLETED BY AHJ

Assigned Variance Number:	☐ Approved ☐ Not Approved

Comments		
Name (Print)	Phone Number	Title ☐ Authority Having Jurisdiction (AHJ) ☐ Acting AHJ
Signature		Date
Name (Print)	Phone Number	Title OSHE Program Manager
Signature		Date

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1297 **Appendix F. Request for Appeal Form**

1298

NIST-XXX	**U.S. DEPARTMENT OF COMMERCE** NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

REQUEST FOR APPEAL

OSHE-FFSG

A. REQUESTER

Name	Division	Building	Room	Phone

B. PROJECT INFORMATION

Project Title	Variance Number
Building	**Room**

Supporting Information for Appeal

D. TO BE COMPLETED BY CHIEF SAFETY OFFICER

☐ Approved	☐ Not Approved

Comments

Name (Print)	Phone Number	Title Chief Safety Officer
Signature		Date

1299