



Subject: LaRC Fire Protection Program

Responsible Office: Safety & Mission Assurance Office

Table of Contents

PREFACE.....	4
P.1 PURPOSE.....	4
P.2 APPLICABILITY.....	4
P.3 AUTHORITY.....	4
P.4 APPLICABLE DOCUMENTS.....	4
P.5 MEASUREMENT/VERIFICATION.....	8
P.6 CANCELLATION.....	8
CHAPTER 1: ADMINISTRATION.....	9
1.1 ENFORCEMENT: AUTHORITY HAVING JURISDICTION.....	9
1.2 EQUIVALENCIES, ALTERNATIVES, MODIFICATIONS, AND RULINGS.....	9
1.3 FIRE, BUILDING, LIFE SAFETY DESIGN, AND DOCUMENT REVIEW.....	10
1.4 ACCESS TO JOB SITE: INSPECTIONS AND ACCEPTANCE TESTING...	11
1.5 CERTIFICATE OF OCCUPANCY.....	12
1.6 IMPAIRMENT OF ESSENTIAL SAFETY SYSTEMS AND EQUIPMENT.....	12
1.7 NOTICE OF VIOLATION: STOP WORK ORDER.....	13
CHAPTER 2: GENERAL SAFETY REQUIREMENTS.....	14
2.1 INSPECTION, TESTING, AND MAINTENANCE (IT&M)	14
2.2 EMERGENCY EVACUATIONS AND FIRE DRILLS.....	14
2.3 REPORTING OF EMERGENCIES.....	15
2.4 TAMPERING WITH ESSENTIAL SAFETY EQUIPMENT.....	16
2.5 OPEN FLAMES AND SMOKING.....	16
2.6 STORAGE OF MATERIALS.....	16
CHAPTER 3: BUILDING SERVICES.....	17
3.1 ELECTRICAL.....	17
3.2 HEATING VENTILATION AND AIR CONDITIONING (HVAC)	17
3.3 ELEVATORS.....	17
3.4 HEATING APPLIANCES.....	18
3.5 STATIONARY GENERATORS AND STANDBY POWER SYSTEMS.....	19
3.6 SMOKE CONTROL.....	19
CHAPTER 4: FEATURES OF FIRE PROTECTION.....	20
4.1 CONSTRUCTION.....	20
4.2 FIRE BARRIERS.....	20
4.3 INTERIOR WALL AND CEILING FINISH.....	21
CHAPTER 5: FIRE PROTECTION SYSTEMS.....	22
5.1 STANDPIPES.....	22
5.2 AUTOMATIC SPRINKLERS.....	22

5.3 FIRE PUMPS.....	23
5.4 WATER SUPPLY.....	24
5.5 OTHER FIRE PROTECTION SYSTEMS.....	25
5.6 PORTABLE FIRE EXTINGUISHERS.....	26
CHAPTER 6: DETECTION, ALARM, AND COMMUNICATIONS SYSTEMS.....	27
CHAPTER 7: MEANS OF EGRESS.....	29
7.1 GENERAL REQUIREMENTS.....	29
7.2 EXITS AND EXIT ACCESS.....	29
7.3 PROTECTION OF STAIRS.....	30
7.4 EMERGENCY LIGHTING.....	31
7.5 EXIT SIGNS.....	31
CHAPTER 8: CONSTRUCTION/DEMOLITION OPERATIONS AND TAR KETTLES.....	33
8.1 CONSTRUCTION/DEMOLITION.....	33
8.2 ASPHALT, TAR KETTLES, AND SIMILAR FIRED EQUIPMENT.....	35
CHAPTER 9: FIRE DEPARTMENT ACCESS AND WATER SUPPLY.....	36
9.1 EMERGENCY ACCESS: FIRE LANES.....	36
9.2 HYDRANTS, FIRE DEPARTMENT CONNECTIONS, VALVES, AND IMPAIRMENTS.....	37
CHAPTER 10: COMBUSTIBLE WASTE AND REFUSE.....	39
CHAPTER 11: AIRCRAFT HANGERS.....	40
CHAPTER 12: CLEAN ROOMS.....	42
CHAPTER 13: ANECHOIC CHAMBERS.....	44
CHAPTER 14: FLIGHT SIMULATORS.....	45
CHAPTER 15: WET CHEMICAL LABORATORIES.....	46
CHAPTER 16: GENERAL STORAGE.....	49
CHAPTER 17: INFORMATION TECHNOLOGY EQUIPMENT.....	50
CHAPTER 18: VITAL AND ARCHIVAL RECORDS STORAGE.....	51
CHAPTER 19: DUST EXPLOSION AND PREVENTION.....	52
CHAPTER 20: WELDING, CUTTING, AND OTHER HOT WORK.....	53
CHAPTER 21: SPRAYING OPERATIONS USING FLAMMABLE OR COMBUSTIBLE MEDIA.....	54
CHAPTER 22: COMMERCIAL COOKING.....	58
CHAPTER 23: INDUSTRIAL OVENS AND FURNACES.....	60
CHAPTER 24: STATIONARY STORAGE BATTERY SYSTEMS.....	61
CHAPTER 25: HAZARDOUS MATERIALS.....	62
CHAPTER 26: COMPRESSED GASES AND CRYOGENIC FLUIDS.....	63
CHAPTER 27: EXPLOSIVES AND PYROTECHNICS.....	66
CHAPTER 28: FLAMMABLE AND COMBUSTIBLE LIQUIDS.....	67
CHAPTER 29: LIQUEFIED PETROLEUM GASES AND LIQUEFIED NATURAL GASES.....	70
CHAPTER 30: VACANT FACILITIES.....	73
CHAPTER 31: TENTS.....	74
CHAPTER 32: CHILD DEVELOPMENT CENTER.....	75
CHAPTER 33: TEMPORARY STRUCTURES, TRAILERS, AND MEMBRANE STRUCTURES.....	76

CHAPTER 34: EMERGENCY RESPONSE SERVICE DELIVERY.....	79
APPENDIX A: DEFINITIONS.....	80
APPENDIX B: ACRONYMS.....	84
APPENDIX C: FIRE PROTECTION IMPAIRMENTS.....	86

Table of Figures

Figure 1, Approved Fire Lane Turnarounds.....	36
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PREFACE

P.1 PURPOSE

This Langley Procedural Requirements (LPR) sets forth the requirements necessary for the Langley Research Center (LaRC) Fire Protection Program to meet National Aeronautics and Space Administration (NASA)-mandated fire, building, and life safety criteria. This program includes the elements of code compliance; management administration; documentation; training; system/facility design and construction; fire protection engineering; fire prevention; annunciation; confinement; suppression; fire department inspection, testing, and maintenance; and quality assurance.

P.2 APPLICABILITY

- a. This directive is applicable to all organizations, including General Service Administration (GSA), United States Army Corps of Engineers (USACE), contractors, tenants, activities, projects, and facilities on Center to the extent specified in their contracts.
- b. In this directive, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms "may" denotes discretionary privilege or permission, "can" denotes statements of possibility or capability, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.
- c. In this directive, all document citations are assumed to be the latest version, unless otherwise noted.

P.3 AUTHORITY

- a. NASA Policy Directive (NPD) 8700.1, NASA Policy for Safety and Mission Success.

P.4 APPLICABLE DOCUMENTS

- a. Occupational Safety and Health Standards, 29 CFR pt. 1910.
- b. Housekeeping, 29 CFR §1915.81.
- c. Safety and Health Regulations for Construction, 29 CFR pt. 1926.
- d. NPR 8715.3, NASA General Safety Program Requirements.
- e. NPD 8820.2, Design and Construction of Facilities.
- f. LPR 1800.1, Langley Research Center Occupational Health Program.
- g. LPR 8715.12, LaRC Integrated Spill Contingency Plan.
- h. LPR 1710.7, Handling and Use of Explosives.

- i. LPR 1710.12, Potentially Hazardous Materials – Hazard Communication Standard.
- j. NASA-STD-8719.11, Safety Standard for Fire Protection.
- k. LaRC-FES-ARCH, Architectural Standard (<https://sites-n.larc.nasa.gov/standards/cod/>).
- l. LaRC-FES-CIVSTR, Civil and Structural Engineering (<https://sites-n.larc.nasa.gov/standards/cod/>).
- m. LF 71, LaRC Hot Work Permit (Fixed or Non-Fixed) (Stock issue: 2-part carbonless, multi-copy).
- n. ANSI/AIHA/ASSP Z9.5-2012, Laboratory Ventilation.
- o. ANSI/ASME A17.1, Safety Code for Elevators and Escalators.
- p. ANSI/ASME A17.3, Safety Code for Existing Elevators and Escalators.
- q. ANSI A119.1, Standard for Mobile Homes.
- r. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- s. ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
- t. FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets, <https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.
- u. ICC, International Building Code (IBC).
- v. ICC, International Mechanical Code (IMC).
- w. ICC, International Plumbing Code (IPC).
- x. ICC, International Fire Code (IFC).
- y. NFPA, Fire Protection Handbook.
- z. NFPA 1, Fire Code.
- aa. NFPA 4, Standard for Integrated Fire Protection and Life Safety System Testing.
- ab. NFPA 10, Standard for Portable Fire Extinguishers.
- ac. NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam.
- ad. NFPA 11A, Standard for Medium- and High-Expansion Foam Systems.
- ae. NFPA 12, Standard on Carbon Dioxide Extinguishing Systems.
- af. NFPA 13, Standard for the Installation of Sprinkler Systems.
- ag. NFPA 14, Standard for the Installation of Standpipe and Hose Systems.
- ah. NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection.
- ai. NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.

- aj. NFPA 17, Standard for Dry Chemical Extinguishing Systems.
- ak. NFPA 17A, Standard for Wet Chemical Extinguishing Systems.
- al. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.
- am. NFPA 22, Standard for Water Tanks for Private Fire Protection.
- an. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- ao. NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- ap. NFPA 30, Flammable and Combustible Liquids Code.
- aq. NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages.
- ar. NFPA 31, Standard for the Installation of Oil-Burning Equipment.
- as. NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.
- at. NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
- au. NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals.
- av. NFPA 51B, Standard for Fire Prevention during Welding, Cutting, and Other Hot Work.
- aw. NFPA 54, National Fuel Gas Code.
- ax. NFPA 55, Compressed Gases and Cryogenic Fluids Code.
- ay. NFPA 58, Liquefied Petroleum Gas Code.
- az. NFPA 59A, Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG).
- ba. NFPA 70, National Electrical Code.
- bb. NFPA 72, National Fire Alarm and Signaling Code.
- bc. NFPA 75, Standard for the Fire Protection of Information Technology Equipment.
- bd. NFPA 80, Standard for Fire Doors and Other Opening Protectives.
- be. NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.
- bf. NFPA 85, Boiler and Combustion Systems Hazards Code.
- bg. NFPA 86, Standard for Ovens and Furnaces.
- bh. NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- bi. NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids.

- bj. NFPA 92, Standard for Smoke Control Systems.
- bk. NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- bl. NFPA 101, Life Safety Code.
- bm. NFPA 102, Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures.
- bn. NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives.
- bo. NFPA 110, Standard for Emergency and Standby Power Systems.
- bp. NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems.
- bq. NFPA 204, Standard for Smoke and Heat Venting.
- br. NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.
- bs. NFPA 214, Standard on Water-Cooling Towers.
- bt. NFPA 220, Standard on Types of Building Construction.
- bu. NFPA 230, Standard for the Fire Protection of Storage.
- bv. NFPA 231, Standard for General Storage.
- bw. NFPA 232, Standard for the Protection of Records.
- bx. NFPA 232A, Guide for Fire Protection for Archives and Records Centers.
- by. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
- bz. NFPA 251, Standard Methods of Tests of Fire Resistance of Building Construction and Materials.
- ca. NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants.
- cb. NFPA 318, Standard for the Protection of Semiconductor Fabrication Facilities.
- cc. NFPA 400, Hazardous Materials Code.
- cd. NFPA 407, Standard for Aircraft Fuel Servicing.
- ce. NFPA 409, Standard on Aircraft Hangars.
- cf. NFPA 410, Standard on Aircraft Maintenance.
- cg. NFPA 484, Standard for Combustible Metals.
- ch. NFPA 495, Explosive Materials Code.
- ci. NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

- cj. NFPA 498, Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives.
- ck. NFPA 652, Standard on the Fundamentals of Combustible Dust.
- cl. NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- cm. NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response.
- cn. NFPA 750, Standard on Water Mist Fire Protection Systems.
- co. NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.
- cp. NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems.

P.5 MEASUREMENT/VERIFICATION

None

P.6 CANCELLATION

LPR 1710.11 Dated July 6, 2010

Original Signed on File

<u>Clayton Turner</u>	<u>10/28/19</u>
Director	Date

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CHAPTER 1: ADMINISTRATION

1.1 Enforcement: Authority Having Jurisdiction

1.1.1 An **Authority Having Jurisdiction (AHJ)** shall be appointed for the administration and enforcement of the **building** codes, fire codes, and the Life Safety Code including requirements from the Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), International Building Code (IBC), International Fire Code (IFC), International Mechanical Code (IMC), Underwriters Laboratories (UL), and Factory Mutual (FM)¹, along with referenced standards, guides, and recommended practices as established in NPR 8715.3 Chapter 5 and NASA-STD-8719.11.

1.1.2 The AHJ shall have the authority to administer the codes as described in NFPA 1, the NFPA “Fire Protection Handbook,” and the International Building Code.

Note: Words that appear in bold are defined in Appendix A.

1.1.3 The AHJ shall possess the following minimum qualifications:

- a. State-certified Fire Officer One or state-certified Fire Marshal;
- b. Certified **Fire Protection** Specialist;
- c. 8 years of experience reviewing plans, documents, and submittals for building, fire, and life safety code enforcement; and
- d. 5 years of experience being an AHJ or working directly with an AHJ.

1.1.4 A memo shall be signed by the Center Director formally naming the Center’s AHJ.

1.2 Equivalencies, Alternatives, Modifications, and Rulings

1.2.1 The AHJ may consider and approve or reject equivalent systems, methods, or devices in lieu of strict prescriptive requirements.

1.2.2 The AHJ shall have the authority to approve alternate materials or methods of construction provided:

- a. The proposed alternative is satisfactory to the AHJ and complies with the intent of the provisions of the **fire protection program**;
- b. The material, methods, or work proposed is at least the equivalent of that prescribed in the fire protection program for level of safety, quality, strength, effectiveness, fire resistance, and durability;
- c. Sufficient technical data have been submitted to substantiate that the alternative method is reliable and provides equal or greater protection than the prescriptive requirements;
- d. The AHJ determines that the evidence submitted is satisfactory proof of performance for the proposed installation; and

¹ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets,
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

- e. The cost of all tests, reports, and investigations required under this provision are paid by the applicant.

1.3 Fire, Building, Life Safety Design, and Document Review

1.3.1 The AHJ shall review and approve or reject all new designs and modifications to ensure that fire, building, and life safety are adequate and meet all relevant codes.

1.3.2 The AHJ shall have the authority to require fire, building, and life safety protection measures greater than that mandated by code based on the hazard of a facility, project, or equipment.

1.3.3 The AHJ shall determine any requirements that are essential for the safety of building occupants that are not specifically provided for by appropriate code.

1.3.4 Facility designs, upgrades, and modifications to NASA-owned facilities shall meet the design criteria requirements.

1.3.4.1 These criteria shall be applied to NASA-leased facilities to the maximum extent allowed by the local building official responsible for compliance with local building code.

1.3.5 All off-site leased facilities shall comply with fire and life safety requirements acceptable to the AHJ.

1.3.6 The portions of facilities occupied by LaRC personnel shall fully comply with NFPA 101.

1.3.7 When upgrades or modifications are made, the AHJ may require the entire system or building to comply with current code.

1.3.8 Where requirements are conflicting, the requirements affording the highest level of safety shall apply.

1.3.9 The fire, building, and life safety related codes and standards in effect when facility design commences (i.e., **code of record**) shall remain in effect for the life of the facility unless a significant hazard that endangers the facility occupants or public is identified by the AHJ.

1.3.10 All equipment components specified in designs shall be compatible with existing equipment and installed as required by the applicable codes and in conformance to manufacturer's instructions and listings.

1.3.11 If a room/area within a facility presents a significantly greater hazard to the facility or its occupants than may be indicated by the occupancy hazard classification of the overall facility, that room/area shall be separated from the remainder of the **structure** by fire barriers and/or **fire protection systems** as determined by the AHJ.

1.3.12 Automatic sprinkler protection shall be required for the following:

- a. New buildings and facilities,
- b. Renovation projects involving over 50 percent of a building or any renovation project that exceeds 2,500 square feet,
- c. Buildings and facilities that have had changes in occupancy, and

- d. As otherwise determined by the AHJ.

Note: Partially-sprinklered buildings shall be considered as unsprinklered for the purpose of applying codes where less stringent options are available for sprinklered facilities.

1.3.13 The AHJ shall have full access to all plans and specifications to ensure compliance with applicable fire, building, and life safety requirements.

1.3.14 All design documents, **work orders**, and job packages shall be provided to the AHJ within five business days of their availability for review and approval.

1.3.15 The Center Operations Directorate (COD) project manager, general contractor, all subcontractors, all designers, the architect and engineers of record, the onsite NASA customer, and other government agencies involved such as the General Services Administration (GSA) and the United States Army Corps of Engineers (USACE) shall submit design documents to the AHJ for review and approval.

1.3.16 All non-compliances with this LPR or its reference documents shall be mitigated by those individuals and organizations listed in Section 1.3.15 of this LPR to the satisfaction of the AHJ before initiating procurement or starting work on a project.

1.3.17 The responsible parties listed in Section 1.3.15 of this LPR shall respond in writing to each noncompliance or question posed by the AHJ.

1.3.18 The AHJ shall provide written documentation to the appropriate parties for each noncompliance or question that requires resolution.

1.3.19 Deviation from **approved** designs that affect code compliance, building performance, fire, and life safety shall be submitted electronically to the AHJ for approval before work begins.

1.3.20 The AHJ authority shall not be exercised by a project manager, general contractor, contracting officer, standard practice engineer, COD, GSA, USACE, or other governmental entity.

1.3.21 No modifications in the use or occupancy of any facility or portion thereof shall be made without prior approval by the AHJ.

1.3.22 The AHJ shall be permitted to require a third-party review at the project's expense by an approved, independently certified entity with expertise in the matter to be reviewed.

1.4 Access to Job Site: Inspections and Acceptance Testing

1.4.1 The AHJ has the authority to inspect any job site, facility, or other premises for dangerous or hazardous conditions; for violations involving fire, building, and life safety requirements; and for actions taken by personnel that increase risk of personal injury or property loss.

1.4.2 If standardized tests are not available or are deemed unacceptable by the AHJ, then written acceptance tests or operating procedures shall be prepared and submitted by the contractor to the AHJ for approval.

Note: Per the contract agreement, documentation should also be submitted to the COR or CO.

1.4.3 The contractor performing the approved tests shall ensure that:

- a. Any deficiencies noted during the acceptance tests are documented by the contractor and tracked until resolved,
- b. The proper functioning of system/equipment during acceptance testing, and
- c. Acceptance testing is performed by a qualified contractor and witnessed by the AHJ or authorized representative.

1.5 **Certificate of Occupancy**

1.5.1 No new construction or renovation project or portion thereof shall be occupied by personnel in whole or part until a **Certificate of Occupancy** (CO) has been issued by the AHJ. A CO indicates that the building/area is in compliance with the referenced codes and allows its full use.

1.5.2 The AHJ shall not issue the CO until all permanent hazard identification signs are installed by the appropriate responsible organizations.

1.5.3 The AHJ may issue a **Certificate of Beneficial Occupancy** (CBO) that covers the period of time following construction when the building/area substantially complies with all fire protection and life safety requirements but is not yet in full compliance.

1.5.4 CBOs shall only be issued so that furniture and equipment may be installed in the facility. Occupancy by the customer (final user) is prohibited.

1.5.5 Flammable/combustible liquids that are not part of approved final construction activities shall not be stored or used in a facility having a CBO.

1.5.6 Preplanned impairments of automatic fire suppression systems or **fire alarm** systems while a CBO is in place shall only be done with AHJ approval.

1.5.7 Safety deficiencies identified in conjunction with the issuance of a CBO shall be mitigated by the contractor.

1.5.8 If OSHA, fire, or life safety deficiencies of imminent danger are identified by the AHJ following issuance of a CBO, the deficiencies shall be mitigated by the contractor within 24 hours or the CBO will be revoked.

1.6 **Impairment of Essential Safety Systems and Equipment**

1.6.1 The contractor or other personnel shall promptly report impairments of essential safety systems to the AHJ and take interim measures to compensate for their outage. See Appendix C for details on reporting **fire protection impairments**.

1.6.2 Impairments of four hours or less occurring during the normal and usual Inspection, Testing, and Maintenance (IT&M) activities required by NFPA and NASA criteria are exempt from the requirements of this section, Section 1.6.

1.6.3 Requests for essential safety system impairments shall be made in advance to the AHJ and Security Service Communication Center (SSCC) by calling (757) 864-5500.

1.6.4 The impairment requests shall be evaluated by the AHJ to determine the effect on safety of the facility and its occupants.

1.6.5 In an emergency, prompt action shall be taken by the contractor or other personnel to limit the damage, such as by isolating the affected portion of the system if an underground water main ruptures.

1.6.6 Formal impairment requests during an emergency shall be made after the emergency has been mitigated.

1.6.7 An impairment plan shall be created by the entity responsible for IT&M and submitted to the AHJ for approval.

1.6.8 Work shall begin as soon as interim protective measures are instituted and the system(s) is shut off.

1.6.9 IT&M personnel shall check repair progress including tagged equipment at least once per shift.

1.6.10 When the system/equipment is restored, IT&M personnel shall inspect the affected system to ensure that equipment is operational.

1.7 Notice of Violation: Stop Work Order

1.7.1 When conditions, operations, or activities are deemed hazardous to life or property or a violation of the requirements of this LPR, the AHJ has the authority to immediately abate the hazardous conditions or stop work as necessary. If a contractor's work is stopped, the AHJ shall contact the Office of Procurement to issue a formal stop work order.

1.7.2 The contractor or other personnel shall notify the AHJ when a hazard or violation has been mitigated and is ready for inspection. If any installation subject to inspection prior to use is covered or concealed without having first been inspected (e.g., buried piping, sheetrock), the AHJ has the authority to require that such work be exposed for inspection.

1.7.3 The AHJ has the authority to order the immediate evacuation of any facility or area deemed unsafe and presenting an imminent danger to occupants. This authority extends to evacuating multiple facilities or to the entire Center as deemed necessary.

1.7.4 The AHJ shall report any construction or installation work being performed in violation of requirements or specifications to the project manager for correction. Not correcting a violation will be cause for the AHJ to withhold issuance of a CO and may result in the contractor receiving a Notice of Violation (NOV).

CHAPTER 2: GENERAL SAFETY REQUIREMENTS

Fire protection and life safety are of the utmost importance at LaRC and shall not be jeopardized, compromised, or superseded by other considerations or concerns.

2.1 Inspection, Testing, and Maintenance (IT&M)

2.1.1 All fire, life, and **building** safety systems and equipment are deemed “essential for safety” by the **AHJ** and shall be inspected, tested, and maintained in accordance with applicable codes, standards (including NFPA 4), industry recommended practices, manufacturer’s specifications, and NASA-specific criteria.

2.1.2 COD shall generate and retain all documentation for IT&M activities on equipment and systems deemed essential for safety, including **fire alarm**, gas, smoke or flame detection, and fire suppression systems. Also included are such items as fire doors, fire and smoke dampers, Automated External Defibrillators (AED), fire extinguishers, fire hydrants, and valves, along with tamper switches and other types of monitoring equipment.

2.1.3 IT&M records (including plans, checklists, notes, reports, and other records associated with the establishment, completion, and verification of corrective actions for the essential safety system issues) shall be permanent records, retained for the life of the system/equipment.

2.2 Emergency Evacuations and Fire Drills

2.2.1 Individuals shall promptly leave a building when notified to do so by LaRC security, fire department (FD) personnel, or when directed to by the AHJ.

2.2.2 Individuals shall promptly leave the building when a fire alarm system is activated unless the following exceptions apply:

- a. The **Facility Coordinator** (FC) provides an alternate building evacuation plan **approved** by the AHJ, or
- b. When notified that routine testing or maintenance will occur.

2.2.3 During evacuations, all work in the affected area shall cease, except those activities directly relating to the evacuation effort.

2.2.4 All personnel, except for those assigned to operations where evacuation presents a more serious hazard than staying, shall immediately leave the area.

2.2.5 The individual(s) to remain in lieu of evacuation shall be predetermined by the FC/**Facility Safety Head** (FSH) and approved by the AHJ.

2.2.6 A facility evacuation diagram approved by the AHJ shall be posted by the FC/FSH in all buildings.

2.2.7 When developing an evacuation diagram, the following criteria shall be used:

- a. The facility floor diagram shall be as simple as possible.
- b. Only walls, doors, room numbers, stairs, areas of refuge, AEDs, **muster points**, or other pertinent information shall be included.
- c. Directional arrows shall be used to illustrate evacuation paths.

- d. A muster point for evacuating personnel that is a safe distance away from the facility shall be noted on the diagram.

2.2.8 The FC/FSH shall review the evacuation diagrams to ensure accuracy and that all evacuation routes are correctly noted.

2.2.8.1 Special facility/operation hazards or circumstances that may require personnel to shelter in place shall seek approval from the AHJ and the Safety and Mission Assurance Office (SMAO) Director.

2.2.8.2 Individuals shall respond to an **evacuation alarm** by promptly leaving the affected/alarmed area without delay and reporting to the designated muster point.

2.2.9 The LaRC Fire Department shall conduct fire drills with sufficient frequency, at least every 12 months, to familiarize occupants with the drill procedure.

2.2.10 FSHs shall ensure floor evacuation diagrams reflecting the actual floor arrangement, exit locations, AEDs, and muster point are posted and oriented in a location and manner acceptable to the AHJ.

2.2.11 During fire drills and testing, an individual may be designated to monitor any secure area(s) when time does not permit for classified material to be placed in secure repositories. Any other time an evacuation alarm sounds or if directed by emergency personnel to evacuate, ALL personnel shall leave the facility immediately regardless of any security concerns.

2.3 Reporting of Emergencies

2.3.1 Any individual observing a fire or other emergency shall:

- a. Immediately call 911 (NASA LaRC landline) or (757) 864-2222 (any other phone) if possible without endangering themselves.
- b. Evacuate the facility or area as quickly as possible.
- c. Activate a manual fire alarm pull station on the way outside should the fire alarm not already be sounding.

2.3.2 The fire alarm manual pull station shall not be activated for workplace violence situations.

2.3.3 Once at the designated muster point and safe, an individual in the group should promptly call (757) 864-2222 from a cell phone to relay the following types of information:

- a. Exact location and nature of fire or emergency;
- b. Whether explosives or highly flammable substances are present and, if so, the identity and location of the substances;
- c. Progress of fire and how long it has been burning;
- d. Name of individual reporting fire or explosion;
- e. If there are personnel requiring assistance with evacuation or rescue; and
- f. Other pertinent information requested by the dispatcher.

2.4 Tampering with Essential Safety Equipment

2.4.1 Individuals shall not render any portable or fixed fire-extinguishing system or device, any fire-warning system or device, or any essential safety equipment inoperative or inaccessible.

2.4.2 The AHJ may render the following items inoperative or inaccessible as necessary during emergencies, maintenance, drills, prescribed testing, alterations, or renovations:

- a. Any portable or fixed fire-extinguishing systems or devices, and
- b. Any fire warning system or device.

2.4.3 No individual shall render a fire protection or essential safety system/device inoperative during an emergency unless by direction of the **incident command**.

2.4.4 No individual, except a person authorized by the AHJ, shall remove, unlock, destroy, or tamper with any locked gate, door, or barricade; chain; enclosure; sign; tag; or seal that has been required by the AHJ pursuant to this LPR.

2.5 Open Flames and Smoking

2.5.1 LPR 1800.1, "Langley Research Center Occupational Health Program," sets forth the LaRC smoking policy and regulations.

2.5.2 The facility shall provide adequate receptacles in designated smoking areas a minimum of 50 feet away from the facility.

2.5.3 Smoking receptacles shall be emptied per NFPA 101.

2.5.4 Carrying or using "strike anywhere" matches on Center is prohibited.

2.6 Storage of Materials

2.6.1 Storage of materials in buildings shall be orderly and stacks stable.

2.6.2 Combustible materials shall be kept away from heaters or other ignition sources by distance or shielding to prevent ignition.

2.6.3 Storage shall be maintained to ensure at least a 2-foot clearance beneath the ceiling in non-sprinklered areas of buildings and a minimum of 18 inches below sprinkler head deflectors in sprinklered areas.

2.6.4 Combustible materials shall not be stored in or near exits, ramps, or stair enclosures.

2.6.5 Combustible materials shall not be stored in boiler rooms, mechanical rooms, or electrical equipment rooms.

2.6.6 In storage occupancies, hazardous materials that exceed the maximum allowable quantities (MAQ) as permitted in NFPA 1 shall be classified as high-hazard contents.

CHAPTER 3: BUILDING SERVICES

3.1 Electrical

3.1.1 The design, installation, use, and maintenance of electrical systems and equipment shall comply with NFPA 70 and applicable NASA criteria.

3.1.2 Electrical wiring and equipment in hazardous locations shall be **approved** by the LaRC Standard Practice Engineer (SPE) for Electrical and the **AHJ**.

3.2 Heating Ventilation and Air Conditioning (HVAC)

3.2.1 All air conditioning and ventilation systems for the handling of air, not contaminated with flammable explosive vapors or dust, shall comply with NFPA 90A, the International Mechanical Code (IMC), and NASA-specific criteria.

3.2.2 Heating equipment such as furnaces and boilers shall comply with the appropriate provisions of NFPA 31, NFPA 54, NFPA 58, NFPA 59A, NFPA 85, NFPA 86, NFPA 211, IMC, FM Global Property Loss Prevention Data Sheets², and NASA-specific criteria.

3.2.3 There shall be no storage of items in mechanical equipment or furnace rooms.

3.2.4 All permanently installed fuel-fired heaters shall be vented to the outside.

3.2.5 Clearances between heaters and combustibles shall be maintained as specified by the manufacturer and its listing.

3.2.6 Gas piping inside a **building** shall be protected against breakage due to settling or vibration per NFPA 54 and the IMC.

3.2.7 Where practical, piping shall be brought above grade and provided with a swing joint before it enters a building.

3.2.8 The venting arrangement shall be such that a break in a gas line at or near the point of entry cannot result in the free flow of gas into the building.

3.2.9 Automatic gas shutoffs are mandatory.

3.2.10 Gas piping, meters, regulators, or other items shall be supported per code.

3.2.11 All vents or rupture discs on equipment shall be vented to the outside of the building.

3.2.12 Gas meter rooms shall be ventilated in a manner that ensures removal of any gas leakage without moving it through the rest of the **structure**.

3.3 Elevators

3.3.1 The design, installation, testing, and maintenance of elevators, conveyers, dumbwaiters, and escalators shall be in accordance with the requirements contained in NFPA 101, ANSI/ASME A17.1, ANSI/ASME A17.3, IMC, and NASA-specific criteria.

3.3.2 Elevator mechanical rooms shall be sprinklered.

² FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets,
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

3.3.3 Elevator mechanical rooms shall have a shunt trip to de-energize electrical equipment. The shunt trip shall operate by activation of 135°F fixed temperature heat detector(s), which activated before the flow of water from sprinkler system commences when a sprinkler head temperature reaches 155°F.

3.3.4 Occupant evacuation elevators shall be marked with signage indicating the elevators are suitable for use by building occupants for emergency evacuations during fires.

3.3.4.1 Such elevators shall be identified on the facility evacuation plan and approved by the AHJ.

3.4 Heating Appliances

3.4.1 Heat-producing appliances shall not be used on or near combustible surfaces unless provided with adequate insulation.

3.4.2 Users shall set up appliances according to manufacturer specifications.

3.4.3 Only those heat-producing appliances that have been approved for the service intended by a nationally recognized testing/certification laboratory shall be used.

3.4.4 Heat producing appliances shall be disconnected from their power source when not in use for an extended amount of time.

3.4.5 Coffee makers and similar small appliances shall be Underwriters Laboratories (UL) Listed and installed so that they are in plain view.

3.4.5.1 These appliances shall be separated from combustibles and be de-energized when not in use.

3.4.6 Heat producing devices shall be plugged directly into a wall outlet and may not be used with extension cords or surge protectors.

3.4.7 Before requesting a portable space heater, all options available to improve comfort and to ensure maximum efficiency and conservation of energy through existing fixed HVAC systems shall be examined by the NASA Energy Manager.

3.4.8 If, as a final solution, a portable space heater is necessary in an area, the NASA Energy Manager and the AHJ may approve its use if the following conditions are met:

- a. Approval received from the **FC/FSH**.
- b. Heater is listed by a nationally recognized testing laboratory such as UL.
- c. Heater is an oil-filled portable electric heater not exceeding 1800 watts.
- d. Due to the additional electrical load, the proposed heater usage is reviewed by an electrician to verify that the available circuit would not be overloaded.
- e. Heater will not be placed against or close to combustible materials or where a tripping hazard may be created because of the heater or its electrical cord.
- f. Heater will be unplugged when space is unoccupied.
- g. Heater will have a feature that automatically de-energizes it if the heater is tilted or tipped over.

3.4.9 When open-flame heaters are proposed for use, a special written permit from the AHJ is required.

3.4.10 Heaters using gasoline or other flammable/combustible liquid for fuel are prohibited in any indoor location.

3.4.11 When heating an interior space, fuel-fired heaters shall be of the indirect-fired type with combustion exhaust gases discharged safely to the outside atmosphere.

3.4.12 If combustion gases cannot be discharged outside, a monitoring program for toxic gases may be allowed if acceptable to the SMAO Industrial Hygienist (IH).

3.4.13 Flammable/combustible liquids shall be stored in UL-listed steel safety cans having spring-loaded, self-closing lids of appropriate color for type of fuel.

3.4.14 Pot-type heaters, open fires, and fires in open-ended drums are prohibited.

3.5 Stationary Generators and Standby Power Systems

Emergency and standby power systems shall be designed, installed, and maintained in accordance with NFPA 110 and NFPA 111. Existing installations shall be maintained in accordance with their original conditions of approval.

3.6 Smoke Control

Smoke control systems shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 92, NFPA 204, and NASA-specific criteria.

CHAPTER 4: FEATURES OF FIRE PROTECTION

4.1 Construction

4.1.1 Structural features of NASA facilities shall be in accordance with this Chapter and the requirements and guidelines of NPR 8820.2, IBC, IFC, NFPA, FM, LaRC-FES-CIVSTR³, and LaRC-FES-ARCH⁴.

4.1.2 Wood construction is prohibited at LaRC unless otherwise authorized by the **AHJ**.

EXCEPTION: Small quantities of combustible wood trim moldings.

4.1.3 Fire retardant lumber and any other combustible materials proposed for use in **construction projects** shall be **approved** by AHJ.

4.1.4 Fire exposure protection factors established by NFPA 80A and IBC shall be used as the basis of establishing minimum separation distances between **buildings**.

4.2 Fire Barriers

4.2.1 Fire-resistant construction shall comply with ASTM E119.

4.2.1.1 Every fire barrier shall be constructed of noncombustible material and have a 1-, 2-, or 3-hour fire-resistance rating as specified by NFPA, IBC, and IFC codes.

4.2.2 When telephone rooms or electrical closets are located one above the other, with unprotected floor penetrations, the enclosure walls are considered to form a shaft, and protection shall be in accordance with the requirements of NFPA 101 and NFPA 70.

4.2.3 Ductwork and other utility penetrations of stair enclosures shall not be allowed with the exception of sprinkler piping, power, and communications wiring dedicated solely for use within stairs.

4.2.4 Through-penetrations in fire walls and floors shall be protected by sealing the penetration with a “fire stopping assembly” that is certified by a nationally recognized independent testing laboratory.

4.2.4.1 The “fire stopping assembly” shall be capable of maintaining the fire-resistance rating of the fire barrier per NFPA 251.

4.2.5 All floor/ceiling assemblies shall have a minimum fire rating of two hours.

4.2.5.1 All new fire rated construction shall be labeled under floors and above ceilings with the appropriate hourly rating.

4.2.6 Fire door and fire/smoke damper assemblies shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 80 and NFPA 105.

4.2.7 COD shall inspect and test all fire doors at least annually.

4.2.8 The condition of doors found to be operating improperly shall be promptly reported to the AHJ and steps taken by the **FC/FSH** to have the deficiency mitigated.

³ LaRC-FES-CIVSTR, Civil and Structural Engineering (<https://sites-n.larc.nasa.gov/standards/cod/>).

⁴ LaRC-FES-ARCH, Architectural Standard (<https://sites-n.larc.nasa.gov/standards/cod/>).

4.2.9 Doors in smoke or fire barriers shall be either self-closing or automatic-closing.

4.2.10 Where a penetrating item uses a sleeve to penetrate the fire barrier, the sleeve shall be securely set in the wall or floor, and the space between the item and the sleeve filled with a UL-listed, fire-stopping material.

4.2.11 Insulation and coverings for items penetrating a fire barrier shall not pass through the wall or floor.

4.2.12 Where fire barriers are required to have a minimum 1-hour fire-resistance rating, recessed fixtures shall be installed in the wall or partition in such a manner that the required fire resistance is not reduced.

4.2.13 Access points to fire and smoke dampers shall be permanently identified by labels or symbols approved by the AHJ.

4.3 Interior Wall and Ceiling Finish

4.3.1 All exposed interior surfaces of interior walls, partitions, and ceilings shall be Class A (0-25) as defined by ASTM E84 regardless of whether or not areas are sprinklered.

4.3.2 Movable walls and partitions, paneling, and wall/crash pads applied structurally or for decoration, acoustical correction, surface insulation, or other purposes shall be considered interior finish and not be considered decorations or furnishings.

4.3.3 Cellular and foamed plastic and textile materials shall not be used as interior wall and ceiling finish unless specifically permitted by the AHJ.

4.3.4 Solid thermoplastics including, but not limited to, polypropylene, high-density polyethylene (HDPE), solid polycarbonate, solid polystyrene, and solid acrylic materials that melt and drip when exposed to flame shall not be permitted to be used as an interior wall or a ceiling finish unless approved by the AHJ.

4.3.5 Light-transmitting plastics used as an interior wall or ceiling finish is prohibited unless approved by the AHJ.

4.3.6 Bulletin boards, posters, and paper attached directly to a wall shall not exceed 20 percent of the aggregate wall area to which they are applied.

4.3.7 Furnishings or decorations of an explosive or highly flammable character shall not be used in LaRC facilities.

CHAPTER 5: FIRE PROTECTION SYSTEMS

5.1 Standpipes

5.1.1 Standpipe systems shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 14, NFPA 25, and NASA-STD-8719.11.

5.1.2 Only NFPA 14 Class I standpipes shall be installed. No hose or nozzles shall be provided in either new or existing facilities.

5.2 Automatic Sprinklers

5.2.1 Fire sprinkler systems shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 13, NFPA 25, and NASA-specific criteria.

5.2.2 Sprinkler systems shall be designed to NFPA 13 Ordinary Hazard Group I or higher requirements. Light hazard sprinkler systems are prohibited at LaRC regardless of hazard.

5.2.3 Deluge and water spray systems shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 13, NFPA 15, NFPA 16, NFPA 25, and NASA-specific criteria.

5.2.4 A 10-psi safety factor shall be used for new sprinkler system designs except as otherwise **approved** by the **AHJ**.

5.2.5 All new sprinkler systems shall be compatible with a TotalPac® integrated, self-contained sprinkler system located within a cabinet to maintain the existing LaRC fire suppression system. This integrated system is used to maintain compatibility and consistency with wet pipe, dry pipe, deluge, and pre-action systems.

5.2.5.1 Whenever device brand names or model numbers are specified, a Justification for Other than Full and Open Competition (JOFOC) shall be processed through LaRC Office of Procurement.

5.2.5.2 The JOFOC shall be completed and approved for each project.

5.2.6 New construction of dry pipe and pre-action sprinkler systems shall utilize compressed nitrogen instead of compressed air to help mitigate interior pipe corrosion.

5.2.7 Systems shall include a butterfly or outside stem/crew and yoke (OS&Y) control valve on both the supply side of the alarm check valve, as well as a post indicator valve (PIV) outdoors.

5.2.8 The PIV shall be located a minimum of 10-feet farther away from a facility than the height of its exterior walls.

5.2.9 All control valves shall be equipped with tamper switches.

5.2.10 All tamper switches, pressure switches, and flow switches shall be connected to the facility **fire alarm** system.

5.2.11 All sprinkler systems shall incorporate a reduced pressure principal backflow preventer with full-flow test header and tamper switches.

5.2.12 Where pendent sprinklers are used in conjunction with finished ceilings, sprinkler heads shall be of the recessed type and centered in the middle of ceiling tiles.

5.2.13 Unconcealed sprinkler piping shall be painted RED. Sprinkler piping that is concealed does not have to be painted.

5.2.14 All standpipes and sprinkler systems of a facility shall be configured so that each fire department connection (FDC) serves all **fire protection system** needs simultaneously.

5.2.15 Acceptance testing shall comply with applicable NFPA and NASA criteria.

5.2.15.1 Hydrostatic testing of systems for a period of not less than two hours shall be required to ensure there are no leaks and be witnessed by the AHJ.

5.2.16 All water-based fire protection systems subject to freezing shall have a winterization plan.

5.2.17 COD shall inspect each system having a winterization plan during the fall of each year to ensure that the system is adequately winterized to protect from freezing.

5.2.17.1 Inspection shall consist of ensuring:

- a. Condition, operation, and adequacy of heating systems;
- b. Condition and operation of thermostats and filters;
- c. The draining of sprinkler system drip lines, fire pump hose headers, dry pipe sprinkler system air compressors, and dry system drum drip auxiliary drains;
- d. Control valve rooms are heated and that the temperature is continually monitored;
- e. That a temperature alarm signal is automatically transmitted to FD via the fire alarm system; and
- f. That all deficiencies identified are mitigated.

5.2.17.2 Winterization plans shall be included in **MAXIMO**.

5.2.18 Freeze protection measures such as portable heaters shall not be used as permanent heating.

5.2.19 The wrapping of fire protection system piping and valves with insulation or heat tape is prohibited as a means to prevent freezing, except as otherwise approved by the AHJ.

5.2.20 COD shall inspect all water-based **fire protection** equipment and systems at the frequencies indicated in NFPA 25, except as otherwise approved by the AHJ.

5.3 Fire Pumps

5.3.1 Fire pumps shall be designed, installed, and maintained to meet the requirements of NFPA 20, NFPA 25, and the manufacturer's specifications.

5.3.2 Fire pump drivers shall comply with NFPA 37 for diesel engines and NFPA 70 for electric motors.

5.3.3 Maintenance personnel shall be qualified in the inspection, testing, and maintenance of fire protection systems.

5.3.4 Qualified personnel shall include, but not be limited to, one or more of the following:

- a. Personnel who are factory trained and certified for fire pump system servicing of the specific type and brand of system being designed.
- b. Personnel who are certified by a nationally recognized fire protection certification organization acceptable to the AHJ.
- c. Personnel who are registered, licensed, or certified for inspection, testing, and maintenance of fire pumps by the Commonwealth of Virginia.
- d. Personnel who are employed and qualified by an organization listed by a nationally recognized testing laboratory for the servicing of fire protection systems.

5.3.5 The contractor or other personnel shall provide a source of heat acceptable to the AHJ for maintaining the temperature of a pump room or pump house above 40°F.

5.3.6 Diesel drivers for fire pumps shall be started no less than once a week and run for no less than 30 minutes to attain normal running temperature.

5.3.7 Batteries and battery chargers shall be inspected by COD per NFPA 20 and NFPA 25 to determine that chargers are operating correctly, that water levels in batteries are correct, and that the batteries hold their charge.

5.3.8 The contractor or manufacturer shall provide complete instructions covering the operation of fire pump controllers.

5.3.8.1 The instructions shall be conspicuously mounted on the controllers.

5.3.9 The controller equipment shall be arranged to automatically start, run, and shut down the engine at the minimum no-flow test frequency and duration required by NFPA 25.

5.4 Water Supply

5.4.1 Fire water systems and fire hydrants shall be designed and installed to meet the requirements of NFPA 24.

5.4.2 Water storage tanks shall be designed, installed, inspected, tested, and maintained in accordance with NFPA 22 and NFPA 25.

5.4.3 Fire mains connecting the facility to the Center underground water supply shall be a minimum of six inches in diameter and solely used for that purpose.

5.4.4 Fire mains running into facilities shall have PIV valves outdoors at locations approved by the AHJ.

5.4.5 No pressure-regulating valve shall be used in the water supply, except by special permission of the AHJ.

5.4.6 Meters are prohibited on dedicated fire mains and the Center underground water supply grid.

5.4.7 All new fire systems shall include a dedicated back-flow preventer with full-flow testing capability.

5.4.8 No shutoff valve shall be permitted in the piping from the FDC to the point that the FDC piping connects to fire system piping.

5.5 Other Fire Protection Systems

5.5.1 Wet chemical fire extinguishing systems shall be designed, installed, and maintained in accordance with NASA STD-8719.11 and NFPA 17A.

5.5.2 Dry chemical fire extinguishing systems shall be designed, installed, and maintained in accordance with NASA STD-8719.11 and NFPA 17.

5.5.3 Clean agent fire extinguishing systems shall be designed, installed, and maintained in accordance with NFPA 2001.

5.5.4 Only FM-200 systems shall be used as clean agent fire extinguishing systems, unless otherwise approved by the AHJ.

5.5.5 No new Halon fire suppression systems or portable extinguishers shall be procured or installed at LaRC facilities. All existing Halon systems and portable extinguishers, with the exception of those used aboard aircraft, have been eliminated on Center.

5.5.6 Areas housing essential equipment and where the **maximum possible fire loss** exceeds \$25 million (including the construction of the area housing the equipment, equipment in the area, and the cost to replace any data lost due to fire or water damage) shall be equipped with a gaseous clean agent fire extinguishing system in addition to automatic fire sprinklers.

5.5.7 For areas where the installation of fire extinguishing systems may not be feasible due to openness of the area, the size of the area, or type of equipment, a performance-based fire safety design shall be developed by the contractor and submitted for approval to the AHJ.

5.5.7.1 Expenses associated with the design shall be borne by the project.

5.5.8 Foam fire extinguishing systems shall be designed, installed, and maintained in accordance with NASA STD-8719.11 and NFPA 409.

5.5.9 Water spray fire extinguishing systems shall be designed, installed, and maintained in accordance with NASA STD-8719.11 and NFPA 750.

5.5.10 The installation of new total flood carbon dioxide suppression systems is prohibited.

5.5.11 COD shall inspect, test, and maintain existing total flood carbon dioxide suppression systems in accordance with NFPA 12.

Note: These systems will eventually be phased out of service.

5.6 Portable Fire Extinguishers

5.6.1 SMAO shall install, inspect, test, and maintain fire extinguishers in accordance with NFPA 10. IT&M frequencies may be modified by the AHJ.

5.6.2 The AHJ shall determine the number, type, size, and location of portable fire extinguishers.

5.6.3 Cabinets housing fire extinguishers shall not be locked.

5.6.4 The location of fire extinguishers shall be conspicuously marked.

5.6.5 The Fire Chief shall provide instruction to personnel on selection and use of fire extinguishers upon request.

5.6.6 Portable fire extinguishers shall only be used under the following conditions:

- a. **Building** is being evacuated (i.e., fire alarm sounding),
- b. FD is being contacted
- c. Fire is small and contained,
- d. If indoors, fire can be fought with the extinguisher user's back to the exit,
- e. Proper type of extinguisher is available, and
- f. Extinguisher user is trained in fire extinguisher use.

5.6.7 Trained personnel utilizing a fire extinguisher should approach a fire from upwind and stay low to avoid breathing smoke.

5.6.8 The **FC/FSH** shall conduct monthly fire extinguisher inspections to include:

- a. Ensuring extinguisher is located in its designated place;
- b. Ensuring access to the extinguisher is not obstructed;
- c. Ensuring pressure gauge reading is in the operable range, checking for broken or missing safety seals; and
- d. Ensuring there is no obvious physical damage, corrosion or clogged nozzle;
- e. Promptly reporting any discrepancies to the Fire Chief for action;
- f. Reporting any used fire extinguishers found to the Fire Chief; and
- g. Removing all used extinguishers from service.

CHAPTER 6: DETECTION, ALARM, AND COMMUNICATIONS SYSTEMS

6.1 **Fire alarm** and detection systems shall be designed, installed, inspected, tested, and maintained in accordance with the provisions of the NFPA 70, NFPA 72, NFPA 101, 29 CFR 1910.165, and NASA-specific criteria.

6.2 The fire detection and alarm systems and the central reporting systems shall be a complete, supervised reporting system configured in accordance with NFPA 72.

6.3 All new fire alarm systems shall be compatible with the Notifier fire alarm system known as ONYXWorks used at LaRC.

6.3.1 Whenever device brand names or model numbers are specified, a JOFOC shall be processed through the LaRC Office of Procurement.

6.3.2 The JOFOC shall be completed and approved by the project manager for each project.

6.4 Equipment shall be compatible with current LaRC systems and be listed by a nationally recognized testing laboratory.

6.5 All fire alarm and detection systems shall provide 100% coverage in facilities. Exceptions allowed by code are not permissible.

6.6 All fire alarm initiating devices shall be individually addressable.

6.7 Each device shall provide the following conditions:

- a. Alarm,
- b. Trouble,
- c. Open
- d. Short, or
- e. Missing or failed appliances along with remote detector sensitivity adjustment capability from the fire alarm control panel (FACP) for smoke detectors.

6.8 Each addressable device shall be capable of being individually disabled or enabled from the FACP and Central System.

6.9 Audible notification devices shall be capable of being silenced by a switch on the FACP, but shall not extinguish any visual notification features.

6.10 Contractors shall include calculations of the ampere-hour requirements for each system component, each panel component, and the battery recharging period in shop drawing submittals to the **AHJ**.

6.11 Voltage drop calculations for notification appliance circuits shall be submitted by the contractor for approval by the AHJ.

6.11.1 Calculations shall indicate that sufficient voltage is available for proper appliance operation.

6.12 Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

- 6.13 The backup batteries shall be sufficient to last a minimum of 48 hours.
- 6.14 Audible notification appliances shall only be connected into notification appliance circuits.
- 6.15 Each Signaling Line Circuit (SLC) loop shall be sized to provide a 20 percent addressable expansion without hardware modifications to the FACP.
- 6.16 Wiring for SLC fire alarm DC circuits shall be a minimum of No. 18 American Wire Gauge (AWG).
- 6.17 Wiring for fire alarm notification DC circuits shall be a minimum of No. 14 AWG with stranded conductors and colored insulation, red for positive and black for negative.
- 6.18 Duct smoke detectors shall be powered from the FACP.
- 6.19 The FACP shall provide supervised addressable relays for HVAC shutdown. An override at the HVAC panel is not permitted.
- 6.20 Visual notification appliances shall be provided by the contractor in the following areas: restrooms and any general usage area such as meeting rooms and hallways; machine rooms and high noise areas; lobbies, break areas, basements, control rooms, and high bays; and where otherwise determined by the AHJ.
- 6.21 Occupant notification circuits shall not be loaded in excess of 80 percent of their maximum current handling capacity.
- 6.22 The contractor shall add an alarm strobe light to the exterior of a facility where new work is being performed at the entrance closest to the FACP.
- 6.23 The use of a key shall be required to reset manual pull stations. Gravity or mercury switches are not acceptable.
- 6.24 Ceiling spot smoke detectors shall utilize photoelectric technology unless otherwise determined by the AHJ.
- 6.25 Smoke detector placement shall be no more than 15 feet from a wall and 30 feet apart, even in corridors, unless otherwise required by the AHJ.
- 6.26 In no case shall devices be installed contrary to their listings.
- 6.27 The contractor shall notify the AHJ prior to installation, alteration, or removal of fire alarm equipment or wiring.
- 6.28 The AHJ shall witness all acceptance tests.
- 6.29 All fire alarm and sub system alarms tied to a FACP shall be tested as a whole.

CHAPTER 7: MEANS OF EGRESS

7.1 General Requirements

7.1.1 All new facility designs or modifications at LaRC shall incorporate and comply with the requirements of NFPA 101, "Life Safety Code."

7.2 Exits and Exit Access

7.2.1 All NASA **buildings** shall comply with the applicable provisions of NFPA 101 and the International Building Code.

7.2.2 Modifications shall be subject to review and approval by the **AHJ**.

7.2.3 Normally secured rooms shall be placarded with an access contact phone/location or allow the emergency response personnel to see inside the room from the corridor via a vision panel.

7.2.3.1 Where a vision panel is installed for this or any other purpose, it shall be maintained free of obstruction (e.g., paint, posters).

7.2.4 Any device or system installed to monitor or record the use of evacuation doors shall be designed and installed so that it cannot, even in the case of failure, impede or prevent the emergency use of the doors.

7.2.5 FSHs or FCs shall ensure hallways, corridors, stairs, doors, and ways to reach them are continuously maintained free of all obstructions or impediments to instant use in the case of fire or other emergency.

7.2.5.1 Use of items such as file cabinets, desks, vending machines, copiers, trash containers, or boxes in such locations is prohibited unless otherwise **approved** by the AHJ. Generally, only corridors having a minimum width of five feet qualify for such an exception.

7.2.6 The force required to fully open any door leaf manually shall not exceed 15 lbf to release the latch, 30 lbf to set the leaf in motion, and 15 lbf to completely open the leaf.

7.2.7 Doors shall be arranged to open from the egress side.

7.2.8 Locks, if provided, shall not require the use of a key, a tool, or special knowledge or effort for operation from the egress side, and only one releasing action shall be necessary to open the door.

7.2.9 A latch or other fastening device on a door leaf shall have an obvious method of operation under all lighting conditions.

7.2.10 Devices shall not be installed on doors that have panic hardware where such devices prevent the free use of the door for purposes of exiting.

7.2.11 Doors with panic hardware shall not be equipped with any locking device, set screw, or other arrangement that prevents the release of the latch when pressure is applied to the releasing device.

7.2.12 With AHJ approval, sensor-release of electrical locking card-key security systems shall be permitted for outside doors and doors serving individual rooms. This

setup is prohibited for fire doors, cross-corridor doors, and other doors serving common areas.

7.2.13 SMAO shall inspect and test areas of refuge at least annually to ensure that directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system, and written identification of the location of the area of refuge are plainly visible within the area of refuge.

7.2.14 Illumination of hallways, stairs, corridors, and other common areas shall be continuous during the time of occupancy.

7.2.15 The installation of energy-saving sensors, switches, timers, or controllers shall be approved in advance by the AHJ and not compromise the continuity of illumination of these spaces.

7.2.16 **FC/FSH** shall maintain routes to exits so that any individual is able to move without undue hindrance, on personal initiative and at any time, from an occupied position to the exits.

7.2.17 No display or exhibit shall be installed or operated to interfere in any way with access to any required exit or with the visibility of any required exit or required exit sign; nor shall any display block access to fire-fighting equipment.

7.2.18 Vehicles to be parked inside a facility not designed for vehicles shall first receive approval from the AHJ, as well as comply with the following:

- a. All fuel tank openings shall be locked and sealed to prevent the escape of vapors.
- b. Fuel tanks shall not contain greater than one-half their capacity or in excess of 10 gallons of fuel, whichever is less.
- c. At least one battery cable shall be removed from the battery used to start the vehicle, and the disconnected battery cable shall then be taped.

7.2.19 Normally unoccupied utility chases that are secured from unauthorized access and are used exclusively for routing of electrical, mechanical, or plumbing equipment shall not be required to comply with the provisions of NFPA 101.

7.2.20 Hangings or draperies shall not be placed over exit doors or located so that they conceal or obscure any exit.

7.2.21 Every exit shall be clearly visible, or the route to reach every exit shall be conspicuously indicated.

7.2.22 Any aisle leading to a corridor, stair, or other escape route shall be a minimum of 36 inches clear width.

7.3 **Protection of Stairs**

7.3.1 Stair enclosures shall NOT:

- a. Be used for anything other than their intended purpose,
- b. Have anything be stored in them, nor
- c. Have their doors chocked open.

7.3.2 COD shall maintain outside stairs to be structurally sound and in good condition without rust.

7.4 Emergency Lighting

7.4.1 Facility emergency lights shall be designed, installed, and maintained in accordance with NFPA 101.

7.4.2 Conference rooms greater than 750 square feet, as well as stairways, corridors, laboratories, shops, basements, or other spaces deemed necessary by the AHJ shall have emergency lighting provided.

7.4.3 The FSH shall visually inspect all emergency lights monthly by verifying the following:

- a. The power cord is plugged in and not damaged, frayed, or longer than 36 inches;
- b. Lamps are not cracked or damaged;
- c. Lamps are properly positioned to provide illumination for the required area(s);
- d. Lamps are not blocked;
- e. The unit is securely mounted; and
- f. The power LED light is on.

7.4.4 COD shall conduct annual operational tests of non-self-testing emergency lights for at least 1 1/2-hours duration consisting of:

- a. Power to emergency lighting units is shut off;
- b. The unit automatically comes on;
- c. Bulbs are working, and if bulbs fail to light, promptly replace bulb; and
- d. Unit continues to emit light for 1 1/2-hours, and if it fails to do so, promptly replace battery.

7.4.5 Emergency lights that have visual and audible alarms and provide automatic diagnostic testing shall not require the annual functional test.

7.4.6 If a self-diagnostic, self-testing battery-powered emergency lighting unit indicates a failure or fault condition, or if any emergency lighting unit does not function or is damaged, this information shall be promptly reported to the AHJ by the FC/FSH.

7.4.7 COD shall repair emergency lights that are found deficient within 24 hours, or portable emergency lights will be provided at the affected area(s) until the permanent lights are restored to service.

7.5 Exit Signs

7.5.1 Exit signs shall be visually inspected by the FC/FSH at intervals not exceeding 30 days.

7.5.1.1 Any problems with exit signs shall be promptly reported to the AHJ.

7.5.2 Decorations, furnishings, or equipment that impairs visibility of an exit sign or signage used to communicate essential safety information are not permitted.

7.5.3 The use of exit signs containing Tritium or any other radioactive material is prohibited.

CHAPTER 8: CONSTRUCTION/DEMOLITION OPERATIONS AND TAR KETTLES

8.1 Construction/Demolition

8.1.1 Facilities undergoing construction, alteration, or demolition operations shall comply with NFPA 1, NFPA 241, OSHA requirements, and NASA-specific criteria.

8.1.2 All actions within this Chapter shall be performed by the construction/demolition contractor unless otherwise indicated.

8.1.3 The contractor shall maintain egress routes deemed appropriate by the **AHJ** in **buildings** under construction at all times.

8.1.4 FD access roads shall be provided at the start of a project and shall be maintained throughout construction by the contractor.

8.1.5 **Temporary** heating equipment shall be installed in accordance with its listing, including clearance to combustible material, equipment, or construction by the contractor.

8.1.5.1 In addition, equipment shall be used, maintained, and refueled in accordance with the manufacturer's instructions.

8.1.5.2 Only temporary heating equipment used under specific conditions set by the AHJ may be placed in service.

8.1.6 Accumulations of combustible waste material, dust, and debris shall be removed by the contractor from the **structure** and its immediate vicinity at the end of each work shift or more frequently as necessary for safe operations.

8.1.7 Rubbish shall not be burned on LaRC property.

8.1.8 Materials susceptible to spontaneous ignition, such as oily rags, shall be stored in a listed disposal container outside of facilities.

8.1.9 Personnel at the worksite shall conduct an inspection of the entire work area at the end of each workday to check for any smoldering or incipient fires and to mitigate any hazardous conditions.

8.1.10 Trash chutes used on the exterior of a building shall be of noncombustible construction.

8.1.11 Storage of flammable and combustible liquids shall be in accordance with NFPA 30.

8.1.12 The contractor shall keep flammable and combustible liquid storage areas free of weeds, debris, and unnecessary combustible materials.

8.1.13 Combustible liquid storage areas shall be posted as "NO SMOKING" with appropriate NFPA 704 signage.

8.1.14 Open flames and smoking shall not be permitted in the liquid storage areas.

8.1.15 Class I and Class II liquids, as defined in NFPA 30, shall be kept in UL-listed, metal safety containers with self-closing lids and flame arrestors.

8.1.16 The construction superintendent shall:

- a. Ensure that personnel receive proper training on all protection equipment use.
- b. Supervise implementation of the hot work permits issued by the AHJ.

8.1.17 No individual shall shut down, shut off, disconnect, block, or otherwise impair any **fire protection/suppression system**, fire hydrant, **fire alarm** system, gas detection system, AED, emergency lighting, exit signage, emergency power, or safety interlock without prior written approval from the AHJ.

8.1.18 Work shall be scheduled to limit the outage to essential safety equipment to the absolute minimum time, and to ensure that all practical precautions are taken, in the form of substitute protection and rescheduling of hazardous hot work until protection is restored.

8.1.19 Temporary protective coverings used on **fire protection** devices during renovations, such as painting, shall be removed by the contractor promptly when work is completed.

8.1.19.1 The painting of sprinkler heads is prohibited.

8.1.20 Site superintendents shall provide **fire watch** services where required by the AHJ.

8.1.21 Hot work and fire watch shall be established per Chapter 20 of this document.

8.1.22 SMAO shall issue instructions to all job site personnel on the correct procedure to notify the FD in the case of a fire or other emergency.

8.1.22.1 The FD number and site address shall be conspicuously posted around the work site by the contractor.

8.1.23 A lighted stairway in compliance with NFPA 101 shall be extended upward as each floor is installed in new construction and maintained for each floor still remaining during demolition.

8.1.24 Fire standpipes shall be maintained by the contractor in conformity with the progress of building construction or demolition in such a manner that they are always ready for FD use.

8.1.25 Fire extinguishers shall be provided by the contractor in plain sight on each floor and at each usable stairway as deemed necessary by the AHJ.

8.1.26 Accumulations of unnecessary combustible forms or form lumber are prohibited.

8.1.27 Protection shall be provided by the contractor to separate an occupied portion of a facility from an area undergoing alteration, construction, or demolition operations. This is often accomplished by the use of temporary walls.

8.1.28 Where underground water mains and hydrants are to be provided, they shall be installed, completed, and in service by COD prior to commencing construction work.

8.1.29 Where required by the AHJ in facilities under construction, a standpipe system, either temporary or permanent in nature, shall be installed by the contractor.

8.1.30 Where a facility is undergoing alterations and protected by a fire protection system, COD shall maintain operational at all times during alteration.

8.1.31 All required exit components shall be maintained in accordance with NFPA 101 and NASA-specific criteria during alterations as deemed necessary by the AHJ.

8.1.32 If a facility intended to be demolished contains a sprinkler system, the system shall not be rendered inoperative without AHJ approval.

8.2 Asphalt, Tar Kettles, and Similar Fired Equipment

8.2.1 Asphalt and tar kettles or similar fired equipment for preparing hot substances shall be located in a safe place outside the building where work is being performed where there is no danger of ignition of combustible materials, and located a minimum of 20 feet from a facility.

8.2.2 The contractor shall provide rope barriers to keep unauthorized personnel 20 feet from the fired equipment.

8.2.3 The contractor shall provide each fired equipment with a metal cover and an accurate thermometer or other gauge located in full view of the operator.

8.2.4 Fired equipment shall be operated at temperatures at least 25 degrees below the ignition point of the material being used.

8.2.5 The user shall verify that the lid will close tight and that the kettle will be constantly attended from 30 minutes prior to operations until 30 minutes after kettle burners have been shut off.

8.2.6 Continuous supervision by the user shall be maintained while such equipment is in operation.

8.2.7 Two 4A:60BC rated multi-purpose dry chemical fire extinguishers shall be provided and maintained by the contractor within 25 feet of each tar kettle.

8.2.8 All heating or melting kettles or pots shall be mechanically stable.

8.2.9 Thinning with flammable solvents shall not be permitted.

8.2.10 Protective equipment shall be used by all individuals handling hot substances.

8.2.11 All personnel on a roof during fired equipment operations shall be trained by the employer on the proper use of a fire extinguisher.

8.2.12 A fire watch is required during torch application and for two hours after completion of torch application.

8.2.13 At least two 2-1/2 gallon containers of water and two 20-pound ABC dry chemical fire extinguishers shall be available within 10 feet of the fired equipment operations for use by the fire watch.

CHAPTER 9: FIRE DEPARTMENT ACCESS AND WATER SUPPLY

9.1 Emergency Access: Fire Lanes

9.1.1 Provisions for facility fire lane accessibility in new facilities or existing facility modifications or additions shall comply with the design criteria contained herein.

9.1.2 Prior to facility configuration alteration, the **FC** or **FSH** shall notify the **AHJ** so that the AHJ may approve any potential fire lane impairments and the FD may update the pre-fire plan.

9.1.3 All roads, even if not designated as a fire line, that provide access to a **building** shall have a minimum vertical clearance of 13 feet 6 inches.

9.1.4 Fire lanes are required within 50 feet for at least 50 percent of the perimeter of the facility.

9.1.5 Fire lanes and building access for emergency response vehicles and personnel shall not be obstructed by trees, vegetation, decorations, security barricades, maintenance vehicles, or waste collection containers.

9.1.6 Fire lanes shall not be less than 20 feet of unobstructed width. See Figure 1.

9.1.7 Fire lanes shall be designed with minimum 25-foot inside turning radius and a minimum 50-foot outside turning radius at turns to accommodate FD apparatus. See Figure 1.

9.1.8 Fire lanes shall be marked by COD with freestanding signs and marked curbs with the words "FIRE LANE – NO PARKING" painted in black letters on a yellow background.

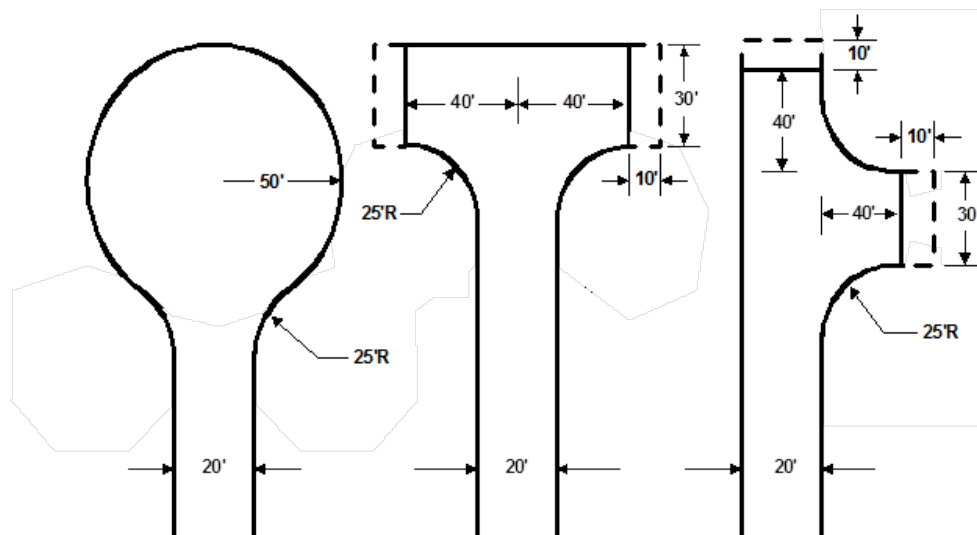


Figure 1, Approved Fire Lane Turnarounds.

9.1.9 Where fire lanes are longer than 150 feet and terminate at a dead end, **approved** provisions for turning around FD apparatus shall be provided. Figure 1 provides an illustration of approved turnaround configurations.

9.1.10 Turnarounds shall have a minimum 50-foot unobstructed radius, or a 30-foot by 80-foot “T”-section, or “Hammerhead” turnaround. “T”-section turnarounds shall include an additional 10 feet of right of way around the 30-foot by 80-foot dimension with no obstructions over 1-foot above grade level.

9.2 Hydrants, Fire Department Connections, Valves, and Impairments

9.2.1 Fire water systems and fire hydrants shall comply with NFPA 1, NFPA 24, NFPA 25, IFC, and NASA-specific criteria.

9.2.2 Fire hydrants, Fire Department Connections, and fire system valves in new facilities or existing facility modifications or additions shall comply with the following clearance requirements:

- a. Obstructions shall not be placed or kept near fire hydrants, fire department connections, or **fire protection system** control valves in a manner that would prevent such equipment or fire hydrants from being immediately visible and accessible.
- b. A minimum 36 inches of clear space shall be required to permit access to and operation of fire protection equipment, fire department connections, and fire protection system control valves.
- c. A clear and unobstructed path shall be required for access to the fire department connections.
- d. Each new FDC shall be unobstructed and located within 50 feet of a fire hydrant.

9.2.3 Explosive facilities, hazardous facilities, and facilities with heavy **fire loading** shall have a remotely located FDC as specified by the AHJ.

9.2.4 Water supply to facilities shall be capable of meeting both **fire protection** and domestic demand.

9.2.5 A dedicated water supply for fire sprinkler systems shall be 6 inches or more in diameter depending on hydraulic calculations specific for that facility.

9.2.6 Domestic water supply and fire protection water supply shall not be shared by a single feed from the main line.

9.2.7 Requirements for new fire hydrants, including hydrant location, shall be determined solely by the AHJ and shall meet the following conditions:

- a. The hydrant shall be located at least 18 inches between the lowest hydrant outlet and grade and not more than 4 feet between the operating nut and grade.
- b. The principal discharge shall be facing the nearest roadway.
- c. An underground hydrant isolation valve shall be installed.
- d. An underground gate valve with road box shall be located at least 5 feet from the centerline of the hydrant.
- e. Hydrants shall be equipped with one 4-1/2-inch and two 2-1/2-inch connections with American National Fire Hose Connection Screw Threads.

- f. Painting of hydrants shall be in accordance with NFPA 291 with hydrant tops and caps painted to denote flow capacity of the hydrant.

9.2.8 Meters shall not be installed on firewater distribution systems.

9.2.9 Requests for the nonemergency use of fire hydrants shall be made to the AHJ prior to use.

9.2.9.1 The request for use shall contain the following information:

- a. Hydrant(s) location(s) and number(s),
- b. Date and duration of use,
- c. Responsible contact person, and
- d. Purpose of use.

9.2.10 Non-emergency use of fire hydrants shall have the following restrictions:

- a. The 4-1/2-inch port shall be reserved for FD use only.
- b. One of the 2-1/2-inch hydrant ports may be reserved for nonemergency use.
- c. The hydrant user shall provide a 2-1/2-inch gate valve on one of the 2-1/2-inch fire hydrant ports, reduced down to 1-1/2 inches.
- d. The hydrant user shall provide a UL-listed backflow preventer to protect potable water supply.
- e. The hydrant user shall provide information on the estimated duration of impairment and the amount of water to be used.
- f. Other sections or systems shall not be out of service.
- g. The requested use shall not affect overall Center operation.

CHAPTER 10: COMBUSTIBLE WASTE AND REFUSE

10.1 Requirements for the storage and handling of combustible waste and refuse shall comply with NFPA 1, IFC, and NASA-specific criteria.

10.2 All actions within this Chapter shall be performed by FSHs and FCs at their facilities and construction contractors at their work sites unless otherwise indicated.

10.3 Combustible waste material shall not be permitted to accumulate in any manner that creates a fire hazard to life or property.

10.4 Combustible waste or refuse shall be properly stored or disposed of by the generator to prevent unsafe conditions.

10.5 No smoking or open flame shall be permitted in any area where combustible fibers are handled or stored.

10.6 "NO SMOKING" signs shall be posted as directed by the **AHJ**.

10.7 Dumpsters and combustible waste containers with an individual capacity of 1-1/2 yd³ or more shall not be stored in **buildings** or placed within 25 feet of facilities.

10.8 Combustible waste shall not:

- a. Be within six feet of a fire door or fire barrier;
- b. Be inside electrical rooms, corridors, stairwells; or
- c. Obstruct the means of egress.

10.9 Waste, debris, scrap, rags, oil, spills or other combustibles resulting from work activity shall be removed and taken to a suitable outdoor location for storage or disposal following the completion of activity or at the end of each work shift, whichever is sooner.

10.9.1 These requirements shall be coordinated with Standard Practice Engineering and Environmental Branch (SPEEB).

10.10 Storage locations shall be **approved** by the AHJ.

CHAPTER 11: AIRCRAFT HANGERS

11.1 Aircraft hangars shall comply with NFPA 407, 409, 410, FM Data Sheets 7-93 and 7-93N⁵, as well as applicable NASA-specific criteria.

11.2 All actions within this Chapter shall be performed by FSHs and FCs unless otherwise indicated.

11.3 Clear spaces shall be maintained around fire extinguishers, manual dump and abort switches for foam extinguishing system, **fire alarm** pull stations, and other **fire protection** equipment.

11.4 In aircraft storage and servicing areas, the distribution of portable and wheeled cart fire extinguishers shall be in accordance with the extra hazard classification outlined in NFPA 10.

11.5 Aircraft hangar facilities shall be posted as “NO SMOKING” areas.

11.6 Combustible and flammable materials and liquids used in the aircraft hangar facility operations shall be limited in quantity to the minimum amount necessary to perform operations for one day or shift.

11.7 Flammable and combustible materials and liquids shall be either removed by the **FC/FSH** from the aircraft hangar facilities immediately after use or stored in UL-approved flammable liquid storage cabinets.

11.8 Waste storage shall be disposed of by the Facility Environmental Coordinator (FEC) in an approved location outdoors, and not be located within hangars.

11.8.1 These fire safety requirements shall be coordinated with SPEEB.

11.9 All electrical systems/equipment (including computers, battery chargers, extension cords, and cell phones) within 18 inches of hanger floors and within the electrically-classified bubble around aircraft shall either be UL-listed as explosion proof or intrinsically safe.

11.10 The area within five feet horizontally from aircraft power plants or aircraft fuel tanks shall be classified as a Class I, Division 2 location, per NFPA 70, that extends upward from the floor to a level five feet above the upper surface of wings and of engine enclosures.

11.11 Aircraft electrical systems shall be de-energized when the aircraft is stored in a hangar and, whenever possible, while the aircraft is undergoing maintenance.

11.12 Aircraft batteries shall not be charged when installed in an aircraft located inside or partially inside a hangar per NFPA 70.

11.13 Aircraft energizers shall be designed and mounted such that all electrical equipment and fixed wiring is at least 18 inches above floor level and shall not be operated in a Class I location per NFPA 70.

⁵ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets, <https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

11.14 Mobile servicing equipment (such as vacuum cleaners, air compressors, and air movers) having electrical wiring and equipment not suitable for Class I, Division 2, NFPA 70 locations shall be designed and mounted so that all such fixed wiring and equipment is at least 18 inches above the floor.

11.14.1.1 Such mobile equipment shall not be operated within a Class I location.

11.15 Equipment that is not identified as suitable for Class I, Division 2, NFPA 70 locations shall not be operated in locations where maintenance operations are likely to release flammable liquids or vapors.

11.16 All 125-volt, 50/60-Hz, single-phase, 15- and 20-amp receptacles installed in areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are to be used shall have ground-fault circuit interrupter protection for personnel.

CHAPTER 12: CLEAN ROOMS

12.1 **Clean rooms** shall comply with NFPA 318, FM Data Sheet 1-56⁶, and applicable NASA-specific criteria.

12.2 All actions within this Chapter shall be performed by FSHs and FCs unless otherwise indicated.

12.3 All PVC, polypropylene and combustible flexible ducts being used in existing installations shall be replaced with UL-listed fume/smoke exhaust systems when upgraded.

12.4 Ducts approved for use in clean rooms shall not have paint or coating on the outside (i.e., exterior) surface.

12.5 Clean rooms shall have emergency lighting.

12.6 Ignitable and corrosive liquids shall not be stored or dispensed inside clean rooms.

12.7 Excess chemicals shall not be stored within processing equipment.

12.7.1 The amount of chemicals within processing equipment shall be limited to the current production needs.

12.8 Good housekeeping practices per 29 CFR 1915.81 shall be established throughout the **clean room** related to support areas and fan attic plenum spaces.

12.9 Combustible material shall not be stored or accumulated within these areas.

12.10 Trash containers of metal construction, equipped with self-closing/extinguishing covers shall be used in clean rooms and associated service corridors, **computer rooms**, and areas containing valuable equipment.

12.10.1.1 When corrosion resistance is necessary, FM 4910-listed, plastic-lined metal containers shall be used.

12.11 15-lb. 2A:10B:C rated Halotron portable fire extinguishers or other **AHJ-approved** clean agent extinguishers shall be provided throughout the clean room.

12.11.1 Dry chemical extinguishers shall not be used because of the potential for corrosion and/or contamination.

12.11.2 Attention shall be given to the compatibility of the fire extinguisher agent and the various process chemicals in use.

12.12 Filters and ducts shall be inspected frequently, and cleaned or replaced periodically.

12.12.1 High-efficiency Particulate Air Filtration (HEPA filters) shall not be patched or plugged to improve their efficiency; this action can adversely affect their fire resistance.

⁶ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets,
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

12.13 Portable tent enclosures utilized as clean rooms shall be approved by the AHJ and a Safety and Facility Assurance Branch (SFAB) industrial hygienist (IH) prior to purchase and installation.

12.14 Fire extinguishers for clean room facilities shall be in accordance with NFPA 10.

12.15 Due to inherent difficulties entering and leaving clean rooms, each clean room shall have its own appropriately sized clean agent portable fire extinguisher installed with 3-D signage above the extinguisher location.

12.16 Combustible materials that are used in clean room facility operations shall be removed by the FEC from the clean room immediately after use, or stored in UL-approved metal containers with lids.

CHAPTER 13: ANECHOIC CHAMBERS

13.1 Anechoic chambers shall comply with the appropriate provisions of NASA STD 8719.11 and FM Data Sheets 1-53, 10-53S.1, and 1-53S.2⁷.

13.2 The **FC/FSH** shall post a sign outside the chamber clearly indicating the absorbing capacity of the liner material in Watt/square inch (W/in²) and the maximum energy density tests that can be conducted inside the chamber that are still compatible with the energy absorbing capacity of the liner material.

13.3 When non-compliant foam is being replaced by a project in existing chambers, it shall be replaced with non-Naval Research Laboratory (NRL) 8093 microwave foam absorber liner material in existing chambers with absorber material that meets NRL 8093 Test Nos. 1, 2, and 3.

13.4 The chamber shall have electric/electronic control cables with abrasion-resistant, non-flammable insulation and screw-on (e.g., bayonet) twist-lock connectors.

13.5 Projects shall obtain written certification from the chamber designer that heat build-up from any fixed lighting installed within the chamber will not expose microwave absorbing liner material, or chamber contents, to within 50% of their piloted auto ignition temperature. Safety lamps (**approved** by the **AHJ**) shall have enclosed fixtures for any high intensity discharge lighting installed within the chamber.

13.6 Limit the energy density of any equipment operated in the anechoic chamber to 0.5 Watt/in² or to the energy density absorbing capacity of the absorber material, whichever is greater.

13.7 Where higher energy densities are expected, use high-power microwave absorbers or high-power composite materials capable of handling the expected incident energy density.

13.8 Projects shall limit the difference in electrical potential between the chamber ground and equipment chassis to 0.5 volts.

13.8.1 Projects shall establish that such electrical potential difference is not exceeded prior to the use of any electrical equipment in the chamber, including **temporary** flexible wiring or exposed power supply terminals.

13.9 Equipment shall not be left operational in the chamber while the control room is unattended.

13.10 Flammable or combustible liquids as well as high-intensity flood lamps shall not be permitted inside the chamber unless approved by the AHJ.

⁷ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets, <https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

CHAPTER 14: FLIGHT SIMULATORS

NASA flight simulators shall be constructed and protected in accordance with the appropriate provisions of FM Data Sheets 5-32, 7-3, and 7-98⁸ and NASA-STD-8719.11.

⁸ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets,
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

CHAPTER 15: WET CHEMICAL LABORATORIES

15.1 The handling or storage of chemicals in laboratory **buildings**, laboratory units, and laboratory work areas whether located above or below grade shall comply with NFPA 1, NFPA 45, NFPA 91, IFC, IMC, and NASA-specific criteria.

15.2 The following requirements shall be performed by the FEC, **FC**, **FSH**, or the user.

15.3 Laboratory units and laboratory hoods in which chemicals are present shall be continuously ventilated under normal operating conditions.

15.4 If laboratory exhaust ventilation is out of service or inoperable, all laboratory operations shall be suspended until the deficiency is corrected.

15.4.1 All hazardous materials shall be secured in a safe condition or removed by the user from the laboratory during the time that the deficiency exists.

15.5 The release of chemical vapors into the laboratory shall be controlled by enclosure(s) or captured to prevent any flammable and/or combustible concentrations of vapors from reaching any source of ignition.

15.6 Energy conservation devices shall only be used in a laboratory ventilation system when **approved** by the **AHJ**.

15.6.1 These systems shall meet, or exceed, the criteria established by ANSI/AIHA Z9.5-2012.

15.6.2 Systems that recirculate within their respective laboratory work area, such as fan coil units for sensible heat loads, are exempt from these requirements.

15.7 Canopy hoods, laminar flow cabinets, and ductless enclosures shall not be used in lieu of chemical fume hoods.

15.8 Deficiencies in hood performance shall result in immediate suspension of all activities inside the hood until the deficiencies are corrected.

15.9 Fixed fire-extinguishing systems protecting filters shall be inspected by COD quarterly for accumulation of deposits on nozzles and cleaned as necessary.

15.10 Handling and storage of chemicals shall be in accordance with NFPA 400.

15.11 Safe storage facilities shall be provided by FC/FSH for materials that have unique physical or hazardous properties, such as temperature sensitivity, water reactivity, or explosiveness.

15.12 Hazardous chemicals shall be stored and handled by the user in such a manner as to limit a spill scenario to less than five gallons.

15.13 Receiving, transporting, unpacking, and dispensing of chemicals and other hazardous materials shall be carried out by trained personnel only.

15.14 Chemical quantities outside of storage shall be maintained by the user at the lowest possible level.

15.15 Handling and storage of chemicals shall conform to the manufacturers' recommendations and the chemicals' Safety Data Sheets (SDS) necessary for the work performed.

15.16 Storage of chemicals in the fume hood is prohibited.

15.17 Liquid waste containers stored in laboratory work areas shall not exceed five gallons.

15.18 Dispensing of Class I, NFPA 30 liquids to or from containers less than or equal to five gallons in capacity shall be performed by the user in a chemical fume hood.

15.19 Class I, NFPA 30 liquids shall not be transferred between conductive containers of greater than one-gallon capacity unless the containers are electrically interconnected by direct bonding or by indirect bonding through a common grounding system.

15.20 Laboratory heating equipment such as ovens, furnaces, environmental chambers, and other heated enclosures shall not be used to heat, store, or test flammable or combustible liquids or aerosols containing flammable gases unless the equipment is designed or modified to prevent internal explosion.

15.21 Baths handling flammable liquids or combustible liquids heated to their flash points shall be placed by the user in a chemical fume hood.

15.22 Lecture, bottle-sized cylinders of the following gases located in laboratory units shall be kept in a continuously, mechanically-ventilated hood or other continuously, mechanically-ventilated enclosure:

- a. All gases that have health hazard ratings of 3 or 4;
- b. All gases that have a health hazard rating of 2 without physiological warning properties, and NFPA 704; and
- c. Pyrophoric gases.

15.23 Cylinders of all gases that are greater than lecture-bottle size and have health hazard ratings of 3 or 4 and cylinders of gases that have a health hazard rating of 2 without physiological warning properties that are located in laboratory units shall meet both of the following conditions:

- a. Storage in approved continuously, mechanically-ventilated gas cabinets, and
- b. Complies with NFPA 55.

15.24 Cylinders of pyrophoric gases that are greater than lecture-bottle size located in laboratory units shall be kept in approved continuously, mechanically ventilated, sprinklered gas cabinets.

15.25 Before laboratory tests or chemical reactions are begun, evaluations shall be made for hazards that can be encountered or generated during the course of the work.

15.26 Unattended or automatic laboratory operations involving hazardous chemicals shall be provided with regular surveillance for abnormal conditions.

15.27 For heating operations, unattended operations shall be provided with override control and automatic shutdown to prevent system failure that can result in fire or explosion.

15.28 Pyrophoric reagents shall be handled only by personnel with experience with the reagents' hazards and properties or be handled under close, direct supervision by

personnel with experience with the reagents' hazards and properties. No one should work alone with pyrophoric reagents during transfer or cleanup operations.

15.29 Open dispensing of pyrophoric liquids shall be performed inside of an inert atmosphere glove box.

15.30 Refrigerators, freezers, and other cooling equipment used to store or cool flammable liquids shall be prominently marked as well as listed as special purpose units for use in laboratories or equipment listed for Class I, Division 1, NFPA 30 locations.

15.31 All unattended electrical heating equipment shall be equipped with a manual reset over-temperature shutoff switch, in addition to normal temperature controls.

15.32 Oven and furnace installations shall comply with NFPA 86.

15.33 Entrances to laboratory units, laboratory work areas, storage areas, and associated facilities shall be identified by signs to warn emergency response personnel of unusual or severe hazards that are not directly related to the fire hazard of contents.

15.34 All permanent piping shall be identified as to its contents at the supply and discharge points.

15.35 Operating controls for research equipment shall be accessible under normal and emergency conditions.

15.36 Hazardous operations as defined in LPR 1710.12, "Potentially Hazardous Materials Communications Standard (PHM)," shall have a PHM permit. The PHM Committee issues permits and reviews safety plans.

CHAPTER 16: GENERAL STORAGE

16.1 Storage facilities shall be constructed in accordance with the applicable sections of the IBC, IFC, FM, NFPA 1, NFPA 101, NFPA 230, NFPA 231, and NASA-specific criteria.

16.2 The **FC/FSH** shall be responsible for ensuring the following requirements are met:

- a. Any commodities that are hazardous in combination with each other shall be stored so they cannot come into contact with each other.
- b. Yard/outdoor storage shall only be permitted in locations **approved** by the **AHJ**.
- c. Yard/outdoor storage locations shall be kept clear of rubbish (e.g., broken pallets, scrap paper, packing materials), vegetation, and any other unnecessary combustible materials.
- d. "NO SMOKING" signs shall be posted around yard/outdoor storage locations.
- e. Storage facilities storing vital and important equipment or supplies shall be located in noncombustible facilities protected with automatic sprinklers.
- f. Personnel shall not cause safe floor loads to be exceeded.
- g. The clearance between stored materials and unit heaters, radiant space heaters, duct furnaces, and flues shall not be less than three feet in all directions.
 - (1) The 3-foot clearance shall be maintained around lights or light fixtures to prevent ignition.
 - (2) The 3-foot clearance shall be maintained around the path of travel of fire doors to ensure the doors' proper operation and inspection.
- h. Operation and inspection clearance shall be maintained around fire extinguishing and **fire protection** equipment.
- i. Industrial trucks using liquefied petroleum gas (LP-Gas) or liquid fuel shall be refueled outside of the storage **building** at a location designated for the purpose.
- j. Containers for rubbish and other trash materials shall be provided and disposed of on a regular basis.
- k. Idle pallets shall be stored outside and safely away from facilities, hazardous storage, and utilities.

CHAPTER 17: INFORMATION TECHNOLOGY EQUIPMENT

17.1 **Information technology equipment** (ITE) and areas shall comply with applicable sections of NFPA 75, NASA-STD-8719.11, as well as the LaRC Facilities Engineering Electrical Standard.

17.2 Access to the ITE area shall be restricted to authorized individuals.

ITE rooms shall not be used for general storage.

17.3 The space beneath the raised floor shall not be used for storage purposes.

17.4 Fire extinguishers in **ITE rooms** shall be UL-listed fire extinguishers of the halogenated agent type "Halotron."

17.4.1 Extinguishers shall have a minimum 2A rating.

17.4.2 The use of dry chemical extinguishers is prohibited.

17.5 Any records regularly kept or stored in an ITE records storage room shall be provided with the following protections:

- a. Vital or important records that have not been duplicated shall be stored in UL-listed equipment with a 1-hour or better fire-resistance rating.
- b. All other records shall be stored in closed metal files or cabinets.
- c. Emergency lighting shall be provided in ITE areas.
- d. The accessible portions of abandoned cables shall be removed unless contained in a raceway.

CHAPTER 18: VITAL AND ARCHIVAL RECORDS STORAGE

18.1 Vital and archival records storage facilities/areas shall comply with NFPA 232 and NFPA 232A.

18.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.

18.3 Vital records shall be stored in a records vault or, for small volumes, in UL-listed 2-hour records protection equipment in a fire-resistive **building**.

18.4 Archival material shall be maintained by COD in an archive or vault.

18.5 All records shall be stored in fully enclosed noncombustible containers.

18.6 Records shall be stored at least three inches above the floor.

18.7 Where sprinklers are installed, records containers shall be kept at least 18 inches below sprinkler deflectors.

18.8 Pendant lamps and extension cords shall not be used within an archive.

18.9 Floors and roofs of archives shall not be pierced for piping.

18.10 Where electronic records are stored on information technology equipment systems, the systems shall be protected in accordance with NFPA 75.

18.11 Stacks, exhaust ducts, and filters shall be cleaned as frequently as necessary to prevent the buildup of combustible dusts and fibers.

18.12 Combustible packing materials, such as shredded paper, Styrofoam™ peanuts, plastic, and excelsior, shall be stored in metal containers with self-closing covers.

CHAPTER 19: DUST EXPLOSION AND PREVENTION

19.1 The design, operation, use, storage, and handling of combustible solids, metals, and dusts, including lithium batteries, shall comply with IBC, IFC, FM, NFPA 484, NFPA 652 and this Chapter, and approval shall be obtained from the **AHJ** before material of this nature can be used or stored in a facility.

19.2 Written procedures for operating facilities and equipment to prevent fires, deflagrations, and explosions from combustible particulate solids shall be developed by projects and submitted to the AHJ for approval. This includes mandatory IT&M of equipment affecting prevention, control, and mitigation of fires, deflagrations, and explosions.

19.3 The AHJ shall train personnel on the potential exposure to and risks associated with combustible dust hazards.

19.4 Glove boxes utilizing inert environments to control a hazard shall maintain a reserve supply of inert gas for emergency use.

19.5 The AHJ and IH shall approve all glove boxes before their purchase, installation, or use.

19.6 Halotron fire extinguishers shall be provided by the facility or project where these hazards, including lithium batteries and **pyrophoric materials**, are involved.

19.7 Ordinary combustible materials, such as paper, wood, cartons, and packing material, shall not be stored or allowed to accumulate near processes where pyrophoric materials and combustible solids, metals, and dusts are handled.

19.8 Non-sparking tools shall be used when handling combustible dusts.

CHAPTER 20: WELDING, CUTTING, AND OTHER HOT WORK

20.1 This Chapter establishes **fire protection** requirements for hot work, which includes the use of flame, heat, smoke, or spark-producing tools in accordance with NFPA 51B. These include, but are not limited to, acetylene and propane torches, electric arc welders, and activities such as grinding or brazing. The following requirements in this Chapter shall be performed by the hot work permit requestor or the **fire watch**.

20.2 A NASA Langley Form (LF) 71, "Hot Work Permit," shall be completed by a representative of the NASA Fire Department prior to the start of work.

20.2.1 It is the responsibility of the individual performing the hot work to obtain a hot work permit by visiting the NASA Langley Fire Station, Building 1248, during normal business hours.

20.2.2 The hot work permit shall be visible and posted in the area where the work is performed.

20.2.3 Hot work shall be conducted in accordance with the permit requirements.

20.3 Hot work activities shall not be performed on the following:

- a. Combustible walls, ceilings or those containing combustible insulation or finish;
- b. Tanks or pipes that have held flammable liquids (unless they have been thoroughly purged and tested for residual vapors); or
- c. Pipes or other metal in contact with combustible materials if ignition of material is possible due to heat conduction.

20.4 Industrial hygiene personnel shall review the process for special ventilation or respiratory requirements when hot work is being performed on metals such as stainless steel, lead, nickel, chromium, or metals with special coatings.

20.5 A flammable vapors test shall be conducted by the requestor when flammable liquids, vapors, or gases may be present. If test results exceed 25 percent of the lower explosive limit (LEL) for liquids and gases, operations shall be shut down.

20.6 Flammable liquids, combustible materials, or oily deposits within 35 feet of the hot work area shall be removed by the user.

20.7 Combustible materials shall be removed by the user from the other side of walls where hot work is performed when hot work is near walls, partitions, ceilings, or roofs of combustible construction.

20.8 Combustible materials that cannot be removed shall be covered or shielded with flameproof covers, fire-resistant guards, or fire-resistant curtains by the user.

20.9 Cracks in walls, floors, or other concealed spaces within 35 feet of the hot work area shall be covered by the user to prevent the passage of sparks or slag to adjacent areas.

20.10 Nearby personnel shall be protected from heat, sparks, and/or slag through the use of fire-resistive screens or shields.

20.11 Where present, automatic sprinkler protection shall remain in service during hot work activities.

20.12 Precautions shall be taken to avoid unwanted activation of automatic detection or suppression systems due to the use of hot work equipment. This includes impairment of the smoke detectors in the work area through the correct **fire protection impairment** protocol.

20.13 A fire watch shall be provided for all hot work operations and fire watch personnel shall have no other collateral duties.

20.14 The fire watch shall ensure that a portable fire extinguisher of adequate size and type is available for the hot work operation.

20.14.1 Extinguishers shall be a minimum 4A:60BC multipurpose dry chemical type.

20.14.2 Facility fire extinguishers shall not be used during hot work activities.

20.15 Multiple fire watchers shall be provided in circumstances where a single fire watch cannot see all hazards created by hot work operations and the hot work operator simultaneously.

20.16 The fire watch shall know the location of the nearest emergency pull station, if available, and have a means to report an emergency to the LaRC Security Service Communication Center (SSCC).

20.17 The fire watch shall continuously monitor the work area during hot work operations for changing hazards and immediately notify the other worker(s) of the changing hazards.

20.18 The fire watch shall monitor the work area for any smoldering fires or hot spots for at least 30 minutes following the end of hot work operation.

20.19 A hot work permit, with a maximum length of one year, may be authorized by the **AHJ** to shops and shop locations where hot work activities are routinely performed.

20.20 Fixed hot work permits for shop areas shall comply with requirements in this Chapter.

20.21 Oxygen and acetylene cylinders, when stored, shall be separated, capped, and properly stored outdoors in an **approved** gas storage area.

20.21.1 Oxygen-acetylene torches being used under a valid, active hot work permit at a fixed location may be left assembled if properly supported and fitted with a correct pressure regulator.

CHAPTER 21: SPRAYING OPERATIONS USING FLAMMABLE OR COMBUSTIBLE MEDIA

- 21.1 Operations involving the spray application of flammable and combustible materials shall comply with NFPA 33, IFC, and this Chapter.
- 21.2 Spray application operations and processes shall be confined to spray booths, spray rooms, spray areas, or outdoors.
- 21.3 Filters shall not be alternately used for different types of coating materials if the combination of the materials might result in spontaneous heating or ignition.
- 21.4 Open flames, spark-producing equipment or processes, and equipment whose exposed surfaces exceed the auto-ignition temperature of the material being sprayed shall not be located in a spray area or in any surrounding area.
- 21.5 Electrical wiring and utilization equipment located in areas adjacent to or connected to the spray area, including, but not limited to, vestibules and tunnels, shall be UL-listed for Class I hazardous locations.
- 21.6 Open containers, supply containers, waste containers, spray gun cleaners, and solvent distillation units that contain Class I liquids shall be located in areas ventilated in accordance with NFPA 33.
- 21.7 To mitigate static electricity as an ignition source, all electrically conductive objects in the spray area, except those objects required by the process to be at high voltage, shall be electrically connected to ground with a resistance of not more than 1 Ω .
- 21.7.1 Portable electric luminaires shall not be used in any spray area while spray application operations are being conducted.
- 21.7.2 Mechanical ventilation shall be operating at all times while spray operations are being conducted, and for a sufficient time thereafter, to allow the vapors from materials and residues to be exhausted.
- 21.7.3 Freshly sprayed work pieces shall be dried only in spaces that are ventilated to prevent the concentration of vapors from exceeding 25 percent of the lower flammable limit.
- 21.8 Dispensing or transfer of liquids from containers and filling of containers, including portable mixing tanks and "pressure pots," shall be done only in a spray area with the ventilation in operation or in a mixing room.
- 21.9 All pressure tubing, hose, and couplings shall be inspected by the user at regular intervals.
- 21.9.1 With the hose extended, the hose and couplings shall be tested by the user using the in-service maximum operating pressure.
- 21.9.2 Any hose showing material deteriorations, signs of leakage, or weakness shall be replaced by the user.
- 21.10 Wherever liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to dissipate static electricity.

21.11 Heaters shall not be located in spray booths or other locations subject to the accumulation of deposits of combustible residue.

21.12 If sprinkler protection is provided, sprinkler heads shall be protected against overspray residue, by either location or covering, so that they will operate quickly in the event of fire.

21.13 Sprinkler heads may be covered only by cellophane bags having a thickness of 0.003 inches or less or by thin paper bags.

21.13.1 These coverings shall be replaced by the user frequently so that heavy deposits of residue do not accumulate.

21.14 Sprinkler heads that have been painted or coated by overspray or residues shall be replaced by COD.

21.15 Maintenance procedures shall be established by projects to ensure that all spray application apparatus and processes are operated and maintained in accordance with the manufacturers' specifications and any requirements mandated by code and this Chapter.

21.16 Spray application operations shall be confined to only areas **approved** by the **AHJ**.

21.17 Inspection of extinguishing systems shall be conducted by COD per code to ensure that the performance of the extinguishing system components will not be affected by overspray and residues.

21.18 All spray areas shall be kept free of excessive accumulation of deposits of combustible residues by the user.

21.19 High-pressure hose lines that convey flammable or combustible coating material in "airless" spray application operations shall be inspected by the user daily and be repaired or replaced as necessary.

21.20 Overspray collectors shall be inspected by the user daily and clogged filters shall be discarded and replaced.

21.21 At the close of the day's operation, all discarded overspray collector filters, residue scrapings, and debris contaminated with residue shall be removed immediately to a designated storage location and either placed in a noncombustible container with a tight fitting lid or placed in a water-filled metal container by the user.

21.22 UL-listed waste containers shall be provided wherever rags or waste are impregnated with sprayed material, and all such rags or waste shall be deposited by the user therein immediately after use.

21.23 Waste containers for flammable liquids shall be constructed of conductive materials and shall be bonded and grounded.

21.24 Personnel's clothing contaminated with sprayed material shall not be left on the premises overnight unless kept in metal lockers.

21.25 Signs stating “NO SMOKING OR OPEN FLAMES” in large letters on a contrasting color background shall be conspicuously posted by the **FC/FSH** at all spray areas and paint storage rooms.

21.26 All personnel involved in spray application processes shall be instructed in the following:

- a. Potential safety and health hazards;
- b. Required operational, maintenance, and emergency procedures; and
- c. Importance of constant operator awareness.

21.27 All personnel shall be instructed in the proper use, maintenance, and storage of all emergency, safety, or personal protective equipment that they might be required to use in their normal work performance.

CHAPTER 22: COMMERCIAL COOKING

22.1 Commercial cooking activities shall comply with NFPA 96, IFC, and this Chapter.

22.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.

22.3 This Chapter shall also apply to residential cooking equipment used for commercial cooking operations unless otherwise exempted by the **AHJ**.

22.4 Maintenance and repairs shall be performed by COD on all components at intervals necessary to maintain good working condition.

22.5 All exhaust systems shall be accessible for cleaning and inspection purposes per NFPA 96.

22.6 A placard approved by the AHJ shall be conspicuously placed near each Class K extinguisher that states that the **fire protection system** shall be activated prior to using the fire extinguisher.

22.7 The addition of obstructions to spray patterns from the cooking appliance nozzle(s) such as baffle plates, shelves, or any modification shall not be permitted.

22.8 Instruction regarding the proper use of portable fire extinguishers and the manual activation of fire-extinguishing equipment shall be documented by SMAO and be provided by the management to new personnel upon their hiring and to all personnel annually.

22.9 Exhaust systems shall be operated whenever cooking equipment is turned on.

22.10 Filter-equipped exhaust systems shall not be operated with filters removed.

22.11 Instructions for manually operating the fire extinguishing system shall be posted conspicuously in the kitchen and be reviewed with personnel by management.

22.12 Cooking equipment shall not be operated while its fire extinguishing system or exhaust system is nonoperational or impaired.

22.13 Where the fire extinguishing system or exhaust system is nonoperational or impaired, the systems shall be tagged by COD as noncompliant, and the AHJ promptly notified.

22.14 Inspection and maintenance of equipment shall be conducted by COD at a frequency determined by the manufacturer's instructions and by the AHJ.

22.15 Maintenance of the automatic fire extinguishing systems and exhaust hoods shall be made every six months by a qualified individual acceptable to the AHJ. See NFPA 96 for detailed IT&M requirements.

22.16 Actuation components for fire dampers shall be inspected by COD for proper operation in accordance with the manufacturer's listed procedures.

22.17 Fusible links on fire damper assemblies shall be replaced by COD at least semiannually or more frequently as necessary.

22.18 The entire exhaust system shall be inspected for grease buildup semi-annually by a qualified individual acceptable to the AHJ.

22.19 If upon inspection, the exhaust system is found to be contaminated with deposits from grease-laden vapors, the contaminated portions of the exhaust system shall be cleaned by a qualified individual acceptable to the AHJ.

22.19.1 At the start of the cleaning process, electrical switches that could be activated accidentally shall be locked out by a safety operator.

22.19.2 Components of the fire suppression system shall not be rendered inoperable during the cleaning process.

22.19.3 Fire extinguishing systems may be rendered inoperable during the cleaning process when serviced by a qualified individual acceptable to the AHJ.

22.19.4 Flammable solvents or other flammable cleaning aids shall not be used.

22.19.5 Cleaning chemicals shall not be applied on fusible links or other detection devices of the automatic extinguishing system.

22.20 When an exhaust system is inspected or cleaned, a certificate showing the name of the servicing company, the name of the individual performing the work, and the date of inspection or cleaning shall be retained by COD.

22.21 Metal containers used to collect grease drippings shall be emptied at least weekly.

22.22 Cooking appliances requiring protection shall not be moved, modified, or rearranged without prior AHJ approval.

22.23 Mobile or **temporary** cooking shall not take place within tents occupied by personnel not involved with food preparation.

22.24 Mobile or temporary cooking operations shall not block fire department access roads, fire lanes, fire hydrants, or other **fire protection** devices and equipment.

22.25 Prior to performing mobile or temporary cooking operations, workers shall be trained by SMAO in emergency response procedures.

22.26 Portable generators shall be positioned by SMAO so that the exhaust is at least five feet in any direction away from any openings, air intakes, means of egress, or from any **building, structure**, or vehicle.

22.27 A carbon monoxide detector approved by the AHJ shall be installed by COD where mobile cooking operations are performed in an enclosed area.

22.28 Propane cylinders shall be secured by the operator in an upright position to prevent tipping over.

CHAPTER 23: INDUSTRIAL OVENS AND FURNACES

23.1 Industrial ovens and furnaces shall comply with NFPA 86, IMC, and this Chapter. The terms “industrial oven” and “furnace” are used interchangeably in this Chapter.

23.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.

23.3 A prominently displayed safety design data form or manufacturer’s nameplate shall be provided by the manufacturer stating the safe operating condition to which the system shall adhere.

23.4 Operating, maintenance, and supervisory personnel shall be instructed and trained by the manufacturer in system/equipment operations.

23.5 Equipment shall be maintained in accordance with the manufacturer’s instructions.

23.6 Before new equipment is installed or existing equipment is modified or relocated, complete plans, sequence of operations, and specifications shall be submitted by the user to the **AHJ** for approval.

23.7 Fuel-fired ovens, furnaces, and environmental chambers shall be equipped with all safety devices in accordance with established safe practices.

CHAPTER 24: STATIONARY STORAGE BATTERY SYSTEMS

- 24.1 Prior to installation, plans shall be submitted by the user and **approved** by the **AHJ** and the SPE for Electrical Systems.
- 24.2 A method to neutralize spilled electrolytes shall be provided by the user.
- 24.3 Rooms and cabinets are required to have adequate ventilation for flooded lead-acid, flooded nickel-cadmium, and valve-regulated lead-acid (VRLA) batteries.
- 24.4 Ventilation of battery storage areas shall be monitored by the **fire alarm** system. See NFPA 70, NFPA 111, and IMC for specific criteria.
- 24.5 The battery environment shall be controlled to maintain temperatures in a safe operating range per the battery manufacturer's specifications.
- 24.6 Signage approved by the AHJ shall be posted by the user at the entrances to rooms or areas containing stationary storage battery systems.
- 24.7 An approved automatic smoke detection system shall be installed in rooms containing stationary battery storage systems.
- 24.8 Stationary storage battery systems shall be housed in a noncombustible enclosure to prevent access by unauthorized personnel.
- 24.9 Combustible materials not related to the stationary storage battery system shall not be stored in battery rooms, cabinets, or enclosures.
- 24.10 Vented batteries shall be purchased with flame-arresting safety caps.

CHAPTER 25: HAZARDOUS MATERIALS

25.1 The storage, use, and handling of hazardous materials shall comply with LPR 8715.12, NFPA 30, NFPA 54, NFPA 55, NFPA 58, NFPA 400, and NFPA 495.

25.2 No storage, use, or handling of hazardous materials shall be permitted in any location where it would jeopardize egress from a **structure**.

CHAPTER 26: COMPRESSED GASES AND CRYOGENIC FLUIDS

26.1 The installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary containers, cylinders, equipment, and tanks shall comply with NFPA 55 and this Chapter.

26.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.

26.3 Compressed gases shall be stored in established gas storage areas on the outside of facilities.

26.2.1 Storage area design and location shall be preapproved by the **AHJ**.

26.4 All compressed gases located indoors shall comply with the following:

- a. Compressed gases connected to systems or equipment shall be deemed "In Use" for the purpose of establishing code requirements.
- b. The storage of gas cylinders within facilities shall be limited to the quantity required for daily operations and be in compliance with NFPA standards.
- c. At no time shall oxygen-acetylene torches be stored indoors, as they pose a severe fire hazard. Oxygen-acetylene cylinders shall be separated, capped, and properly stored outdoors in an **approved**, gas storage area.

EXCEPTION: Oxygen-acetylene torches used under a valid, active hot work permit may be left assembled if properly supported and fitted with correct pressure regulators.

26.5 Indoor storage of propane cylinders is prohibited.

26.6 Compressed gas cylinders shall be identified according to their contents, free of defects, and within their hydrostatic test dates.

26.7 Where gases of different types are stored at the same location, cylinders shall be grouped by types of gas (e.g., flammable, inert, oxidizer).

26.8 Flammable and oxidizing compressed gas cylinders located outside shall be separated by 20 feet or a 5-foot high, 30-minute fire-rated wall.

26.9 Hazard identification signs shall be placed at all entrances to locations where compressed gases are stored, used, or handled in accordance with NFPA 704.

26.9.1 Ratings shall be assigned as per NFPA 704.

26.10 Signs shall not be obscured or removed and shall be visible from any direction of approach.

26.11 Signs prohibiting smoking or open flames within 25 feet of area perimeters shall be provided in areas where the following gases are stored or used:

- a. Toxic,
- b. Highly toxic,
- c. Corrosive,

- d. Unstable reactive,
- e. Flammable,
- f. Oxidizing, or
- g. Pyrophoric.

26.12 Defective cylinders, containers, and tanks shall be returned to the supplier.

26.13 Compressed gas cylinders, containers, and tanks containing residual product shall be treated as full.

26.14 To prevent them from falling or being knocked over, compressed gas cylinders, containers, and tanks, in use or in storage, shall be secured by corraling them and securing them to a cart, framework, or fixed object by use of a UL-listed restraint.

26.15 Compressed gas cylinder, container, and tank valves shall be protected from physical damage by means of protective caps, collars, or similar devices.

26.16 Gastight valve outlet caps or plugs shall be provided and in place for all full or partially full cylinders, containers, and tanks containing toxic, highly toxic, pyrophoric, or unstable reactive NFPA 55 Class 3 or Class 4 gases that are in storage.

26.17 Combustible waste, vegetation, and similar materials shall be kept a minimum of 10 feet from compressed gas cylinders, containers, tanks, and systems.

26.18 Compressed gas cylinders, containers, and tanks, whether full or partially full, shall not be exposed to temperatures exceeding 125°F.

26.19 Compressed gas cylinders, containers, and tanks that have not been designed for use under elevated temperature conditions shall not be exposed to direct sunlight outdoors where ambient temperatures exceed 125°F.

26.19.1 The use of a weather-protected **structure** or shaded environment for storage or use as a means to protect against direct exposure to sunlight shall require approval from the AHJ.

26.20 Service, repair, modification, or removal of valves, pressure relief devices, or other compressed gas cylinder, container, and tank appurtenances shall be performed by qualified personnel.

26.21 Connecting devices shall be free of oil, grease, and dirt and have threads corresponding to the cylinder valving.

26.22 Compressed gas cylinders, containers, and tanks shall not be used for any purpose other than to serve as a vessel for containing the product for which it was designed.

26.23 Gas from gas cylinders shall not be used without approved, reducing regulators.

26.23.1 These regulators shall be UL-listed for the specific gas in use.

26.24 Leaking, damaged, or corroded compressed gas cylinders, containers, and tanks shall be removed from service.

26.25 Compressed gas systems that are determined to be leaking, damaged, or corroded shall be repaired by a certified contractor to a serviceable condition or removed from service.

26.26 Cylinders, containers, and tanks shall be protected from direct contact with soil or surfaces where water might accumulate.

26.27 The release of purged gases or mixtures containing any quantity of corrosive, toxic, or highly toxic gases shall be through a treatment system.

26.28 Cylinders, containers, and tanks containing liquefied flammable gases and flammable gases in solution shall be positioned in the upright position.

26.29 Hand carts, hand trucks, or other mobile devices (e.g., carts, trucks) used to move cylinders, containers, and tanks shall be designed for the secure movement of such items.

26.30 Ropes, chains, or slings shall not be used to suspend compressed gas cylinders, containers, and tanks unless provisions at time of manufacture have been made on the cylinder, container, or tank for appropriate lifting attachments, such as lugs.

26.31 Valves shall be closed when cylinders are transported, moved at sites, and connected for use.

26.32 Static producing equipment located in flammable gas areas shall be grounded.

26.33 Maintenance of flammable gas system piping and components shall be performed annually by a qualified individual.

26.33.1 This maintenance shall include inspection for:

- a. Physical damage,
- b. Leak tightness,
- c. Ground system integrity
- d. Vent system operation,
- e. Equipment identification,
- f. Warning signs,
- g. Operator information and training records,
- h. Scheduled maintenance and retest records,
- i. Alarm operation, and
- j. Other safety-related features.

26.34 A qualified individual shall be in attendance at all times that cryogenic fluid is transferred from mobile supply units to a storage system.

26.35 Dispensing of cryogenic fluids associated with physical or health hazards shall be conducted in locations approved by the AHJ.

CHAPTER 27: EXPLOSIVES AND PYROTECHNICS

The transportation, storage, and use of explosive materials shall comply with NFPA 495, NFPA 498, and LPR 1710.7, "Safety Program for the Handling and Use of Explosives at NASA Langley Research Center."

CHAPTER 28: FLAMMABLE AND COMBUSTIBLE LIQUIDS

28.1 The storage and use of flammable and combustible liquids shall comply with NFPA 1, NFPA 30, NFPA 30A, NFPA 45, NFPA 497, NASA STD 8719.11, 29 CFR Part 1910, 29 CFR Part 1926, IFC, FM, and this Chapter.

28.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.

28.3 Users of flammable or combustible liquids shall be knowledgeable as to their hazard classifications, Safety Data Sheets (SDS), as well as the requirements governing their storage and use.

28.4 All flammable and combustible liquid handling equipment and storage areas shall be labeled in accordance with the NFPA.

28.5 Flammable or combustible liquids shall only be stored in designated locations **approved** by the **AHJ** and segregated from incompatible materials.

28.6 Flammable and combustible liquids shall not be stored in proximity to stair enclosures, corridors, aisles, exits, or other escape routes.

28.7 Flammable liquids shall be stored in UL-Listed or FM-approved flammable liquids storage cabinets and safety cans and meet the following requirements:

- a. Oil-based paints, varnish, shellac, and similar substances may be stored in their original shipping containers (with packing materials removed).
- b. The total aggregate volume of NFPA 30 defined Class I, II, and IIIA liquids shall not exceed 120 gallons in each storage cabinet.
- c. Of the 120 gallon total volume permitted in each cabinet, the total combined aggregate volume of NFPA 30 defined Class I and II liquids shall not exceed 30 gallons.

28.8 When flammable liquid storage cabinets are used, not more than three cabinets shall be stored in a single **fire area**. In industrial facilities, additional cabinets (limited to groups of three) may be stored in the same fire area, provided the groups of cabinets are separated by 100 feet.

28.9 When flammable liquid storage cabinets are used, the vent openings shall be sealed with fitted metal bungs.

28.10 If forced ventilation is to be used, design shall be approved by the AHJ.

28.11 Storage of any type is not permitted on top of flammable storage cabinets.

28.12 When storage quantities exceed amounts outlined above, the liquids shall be stored in dedicated flammable liquid rooms or other facilities complying with NFPA 30.

28.13 Flammable liquid storage cabinets shall be grounded.

28.14 All flammable materials or liquid unused at the end of the day or work shift shall be stored per NFPA 45.

28.15 Open containers of flammable or combustible liquids shall not be left out unattended.

28.16 Flammable liquids shall be in closed containers at all times when not in actual use.

28.17 Containers and drums that have previously contained flammable liquids shall have covers, caps, or bungs replaced immediately after emptying.

28.18 Bungs shall be replaced with pressure and vacuum relief vents once a sealed drum is opened.

28.19 Safety cans shall:

- a. Not exceed five gallons,
- b. Be constructed of steel,
- c. Have self-closing caps, and
- d. Have flame arrestor screens.

28.20 In facility work areas, not more than a one-day supply of flammable or combustible liquid shall be stored in a single fire area outside of a UL-listed flammable liquid storage cabinet. This does not apply to storage areas.

28.21 Air pressure shall not be used on a drum, portable tank, or small container for transferring flammable and combustible liquids.

28.22 Liquids shall be transferred to or from safety cans by means of a listed hand pump drawing through the top, or by gravity through an approved self-closing valve.

28.23 When transferring liquids between conductive containers, the containers shall be bonded with a wire.

28.23.1 The bonding wire or one of the containers shall be grounded.

28.24 When transferring Class I liquids (per NFPA 30) in laboratories from containers of less than a 5-gallon capacity, the transfer shall be made either inside a laboratory exhaust hood or in an area provided with ventilation adequate to prevent the accumulation of a flammable vapor/air mixture exceeding 10 percent of the lower flammable limit.

28.25 When transferring Class I liquids (per NFPA 30) in laboratories from containers of 5-gallon capacity or more, the transfer shall be made either from a separate area outside of the facility or in a separate, inside storage room that complies with the requirements of NFPA 45.

28.26 The use of 1-gallon glass or plastic containers for storage of flammable liquids is prohibited except when authorized by the AHJ.

28.27 Class 1A and Class 1B (per NFPA 45) liquids are permitted to be stored in glass or plastic containers of not more than one gallon, if necessary, for liquid purity or to avoid excessive corrosion of metal containers.

28.28 Each area where flammable or combustible liquids are stored or dispensed shall be marked with DANGER signs stating, "NO SMOKING OR OPEN FLAMES."

28.29 Flammable/combustible waste and liquid shall be stored in closed, metal containers for daily disposal outside of the facility. This requirement is coordinated with SPEEB.

CHAPTER 29: LIQUEFIED PETROLEUM GASES AND LIQUEFIED NATURAL GASES

- 29.1 The storage, use, and handling of liquefied petroleum gases (LP-Gas) shall comply with the requirements of this Chapter and NFPA 58.
- 29.2 All actions within this Chapter shall be performed by the user or system owner unless otherwise indicated.
- 29.3 Containers that show excessive denting, bulging, gouging, corrosion, or have been involved in a fire shall be removed from service.
- 29.4 Cylinders shall incorporate protection against physical damage to the cylinder and any items connected to the cylinder.
- 29.5 Compressed gas cylinders shall be marked "Flammable" and either "LP-Gas" or "Propane."
- 29.6 All containers that contain unodorized, LP-Gas products shall be marked "NOT ODORIZED."
- 29.7 Piping (including hose), fittings, and valves shall comply with NFPA 58.
- 29.8 LP-Gas containers shall be located outside of **buildings** unless they are specifically allowed by the **AHJ** to be located inside of buildings.
- 29.9 Containers that have been removed from service but that contain LP-Gas shall be stored outside of buildings.
- 29.10 Containers shall not be stacked one above the other.
- 29.11 Combustible materials shall not accumulate or be stored within 10 feet of a container.
- 29.12 Aboveground LP-Gas containers shall not be located beneath overhead electric power lines that are over 600 volts, nominal.
- 29.13 Liquid shall be transferred into containers, including containers mounted on vehicles, only outdoors.
- 29.14 The transfer hose shall not be routed in or through any building.
- 29.15 LP-Gas containers or systems that are installed within 10 feet of vehicular thoroughfares shall be provided with vehicular barrier protection (e.g., bollards).
- 29.16 Containers shall be securely anchored to prevent flotation due to possible high flood waters or high water table for underground and partially underground containers.
- 29.17 Cylinders shall not be in contact with the soil.
- 29.18 Emergency remote shutdown stations shall be identified by a sign, visible from the point of transfer, incorporating the words "Propane — Container Liquid Valve Emergency Shutoff" in block letters of not less than two inches in height on a background of contrasting colors to the letters.

29.19 The use and transportation of cylinders in the unoccupied portions of buildings or **structures** under construction or undergoing major renovation that are partially occupied shall be **approved** by the AHJ.

29.20 The amount of LP-Gas in cylinders for research and experimental use in the building shall be limited to the smallest practical quantity.

29.21 Cylinders used temporarily inside buildings for exhibitions or demonstrations, including use in classroom demonstrations, shall not exceed 5 lb. nominal propane capacity.

29.22 Where vehicles with LP-Gas fuel systems are parked, serviced, or repaired inside buildings, the fuel system shall be leak-free, and the container(s) shall not be over-filled.

29.23 The vehicle shall not be parked near sources of heat, open flames, or similar sources of ignition, or near unventilated pits.

29.24 At least one qualified individual shall remain in attendance at the transfer operation from the time connections are made until the transfer is completed, shutoff valves are closed, and lines are disconnected.

29.25 Injection of compressed air, oxygen, or any oxidizing gas into containers to transfer LP-Gas liquid is prohibited unless permitted by the AHJ.

29.26 "Single trip," "non-refillable," or "disposable" cylinders shall not be refilled with LP-Gas.

29.27 Transfer of refrigerated product shall be made only into systems that are designed to accept refrigerated product.

29.28 Sources of ignition shall be turned off and precautions taken to mitigate static electricity during transfer operations, while connections or disconnections are made, or while LP-Gas is being vented to the atmosphere.

29.29 Smoking, open flame, portable electrical tools, and extension lights capable of igniting LP-Gas shall not be permitted within 25 feet of a point of transfer while filling operations are in progress.

29.30 Hose assemblies shall be observed for leakage or for damage that could impair their integrity before each use.

29.31 Inspection of pressurized hose assemblies shall include inspection for the following:

- a. Damage to outer cover that exposes reinforcement;
- b. Kinked or flattened hose;
- c. Soft spots or bulges in hose;
- d. Couplings that have slipped on the hose, are damaged, have missing parts, or have loose bolts; and
- e. Leakage other than permeability leakage.

29.32 Hose assemblies shall be immediately replaced, repaired, or continued in service based on the results of the inspection.

29.33 Screw-on-type caps or collars shall be in place on all cylinders stored, regardless of whether they are full, partially full, or empty, and cylinder outlet valves shall be closed.

CHAPTER 30: VACANT FACILITIES

30.1 Vacant facilities shall be managed and protected by COD in accordance with the appropriate provisions of FM Data Sheets 9-17⁹ and LaRC standards.

30.2 All actions within this Chapter shall be performed by COD unless otherwise indicated.

30.3 Upon vacating or abandoning a facility or property, the **FSH** shall have combustible and hazardous materials removed to the extent specified by Standard Practice Engineering and Environmental Branch (SPEEB), Safety and Facility Assurance Branch (SFAB), and the **AHJ** in order to achieve an acceptable level of safety.

30.4 Vacant facilities and properties shall be maintained free of accumulations of combustible and hazardous materials.

30.5 Vacant facilities shall be securely locked or barricaded to prevent entry by unauthorized individuals.

30.6 Fire sprinkler and standpipe systems shall be maintained in an operable condition at all times except as follows:

- a. Where the type of construction, fire separation, and security of the **structure** does not, in the judgment of the AHJ, create a fire hazard.
- b. If maintaining sufficient facility heat to avoid freezing is impractical, the automatic sprinkler system shall be reconfigured for cold weather operation in accordance with FM Data Sheet 2-8N.
- c. If the interruption of heat is likely to be long-term or permanent, wet pipe systems may be required by the AHJ to be fully converted to dry pipe systems.

30.7 **Fire alarm** systems shall be maintained in an operable condition at all times.

30.8 The minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times in accordance with NFPA 101.

30.9 Alternate uses of a facility while vacated are prohibited unless written approval is obtained from the SPEEB, COD, and the AHJ.

⁹ FM Global, Factory Mutual (FM) Global Property Loss Prevention Data Sheets,
<https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>.

CHAPTER 31: TENTS

31.1 Tents shall only be used on a **temporary** basis not to exceed 14 days unless **approved** by the **AHJ** and in compliance with NFPA 102.

31.2 All actions within this Chapter shall be performed by the user unless otherwise indicated.

31.3 All tent fabric shall meet the flame propagation performance criteria contained in Test Method 2 of NFPA 701.

31.4 Adjacent tents shall be spaced to provide an area to be used as a means of emergency egress.

31.5 The placement of tents relative to other **structures** shall be at the discretion of the AHJ.

31.6 Smoking shall not be permitted in any tent.

31.7 Fire extinguishers shall be furnished and maintained in tents in such quantity and in such locations determined by the AHJ.

31.8 Fuel-fired heaters and their installation for use with tents shall be approved by the AHJ.

31.9 Liquefied petroleum gas tanks shall be installed not less than 60 inches from any tent by a certified contractor.

31.9.1 Tanks shall be secured in the upright position and protected from vehicular traffic by a certified contractor.

CHAPTER 32: CHILD DEVELOPMENT CENTER

32.1 Special protective covers for all electrical receptacles shall be installed by the **FC/FSH** in all areas of the child development center.

32.2 It shall be the duty of the child development center staff to inspect all exits daily to ensure that all hallways, doors, and gates are in working condition.

32.3 Adequate staff shall be on duty and alert at all times where children are present.

CHAPTER 33: TEMPORARY STRUCTURES, TRAILERS, AND MEMBRANE STRUCTURES

33.1 Trailers and temporary, portable, and membrane **structures** shall be located at least 25 feet from permanent **buildings** and at least 25 feet apart, unless joined to form a single complex.

33.2 All trailers and modular structures shall meet the appropriate construction, mechanical system, and electrical system installation requirements of ANSI A119.1.

33.3 Trailers and temporary, portable, and membrane structures that exceed 2,500 square feet shall meet all requirements for new permanent structures, as well as the following requirements, or as determined by the **AHJ**.

33.3.1 Structures that exceed 2,500 square feet shall:

- a. Be fully sprinklered, and
- b. Have a **fire alarm** system with 100% smoke detector coverage.

33.4 Requirements for structures having an area less than 2,500 square feet shall be determined by the AHJ.

33.5 All portable structures shall comply with the requirements specified in the IBC.

33.6 All portable structures used to support construction/demolition operations shall comply with NFPA 241 and 29 CFR 1926.

33.7 Trailers and modular structures arranged for occupancy shall comply with all interior finish, concealed space, and exit requirements within this LPR.

33.8 Each portable structure shall have support and anchoring systems that will resist overturning and lateral movement against wind loads per the IBC.

33.9 Support and anchoring equipment shall be in accordance with the manufacturer's specifications.

33.10 All walkways shall be constructed of non-skid weather resistant materials for use with **temporary** trailers.

33.11 Exits from a portable structure shall discharge to an adjacent roadway or sidewalk.

33.11.1 Exit pathways leading away from the structure shall be crush and run, concrete, or other material **approved** by the AHJ.

33.12 Stairs with platforms and handrails shall be provided by COD for each exterior door per NFPA 101.

33.13 Exterior stairs, ramps, platforms, and walkways shall have a permanent, nonskid walking surface.

33.14 Ramps or wheelchair lifts shall be provided by COD for portable structures that are to be used by the physically handicapped.

33.15 All normally occupied portable structures shall have a minimum of two exits remote from each other.

33.15.1 Other egress arrangements shall be as specified by NFPA 101.

EXCEPTION: Small construction trailers as approved by the AHJ.

33.16 All portable structures shall have sufficient emergency lights to illuminate exit paths.

EXCEPTION: Small temporary construction trailers as approved by the AHJ.

33.17 Approval to locate a portable structure inside a permanent structure shall be made by the AHJ on a case-by-case basis.

33.18 The location of portable structures in permanent structures shall not hinder the safe movement of personnel nor be in violation of the requirements of NFPA 101.

33.19 Temporary enclosures erected within or in proximity to a facility shall not be structurally supported by piping arrangements designed for automatic sprinkler systems and other **fire protection** equipment.

33.20 Temporary enclosures shall be provided by COD with adequate temporary **fire protection systems** and/or portable fire extinguishers, as determined by the AHJ.

33.21 Fire protection systems installed in temporary enclosures shall comply with all applicable NFPA standards.

33.22 Only noncombustible supports and panels, flame resistant tarpaulins, or **approved materials** of equivalent fire retardant characteristics shall be used for construction of temporary enclosures.

33.23 The material specified for the shell of a membrane structure shall pass the NFPA 701 large-scale test.

33.24 The material specified for the shell of a membrane structure shall meet the requirements of a maximum flame spread of 25 and a maximum smoke development of 450 per ASTM E84.

33.25 The material specified for the shell of a membrane structure shall be submitted by COD to a third-party, independent testing laboratory for evaluation, and the test results submitted to the AHJ for approval.

33.26 The use of temporary equipment or structures may be approved by the AHJ for up to six months.

33.27 Users may apply to the AHJ for one six-month extension.

33.28 Temporary equipment or structure use shall not exceed one year in duration.

33.29 Temporary equipment or structures in use or remaining at the Center in excess of one year shall be brought up to code as a permanent facility, or be removed from the Center.

33.30 All enclosing material shall be fastened by COD securely so it cannot be blown against heaters or other sources of ignition.

33.31 Temporary enclosures, trailers, sheds, security barricades, and other facilities, when located within a structure or within 30 feet of a structure, shall be of non-combustible construction.

CHAPTER 34: EMERGENCY RESPONSE SERVICE DELIVERY

34.1 Administration

34.1.1 NASA LaRC has an Interagency Agreement (IA) with the City of Hampton for **fire protection** and emergency medical response. Response times, Standard Operating Procedures, and NASA Station operations shall be per this IA and applicable requirements within NFPA 1710.

34.1.2 The NASA **AHJ** has the authority to modify or eliminate any specific requirements within NFPA 1710 as deemed appropriate and shall administer the IA in accordance with the terms of the agreement.

34.2 Incident Command (IC)

34.2.1 The **Incident Command** (IC) conducting operations in connection with the extinguishment and control of any fire, explosion, hazardous materials incident, natural disaster, rescue, and/or other emergency has the authority to: (1) direct all operations of fire extinguishment, mitigation of a hazardous materials incident, natural disaster, rescue, and/or control and (2) to take necessary precautions to save life, protect property, and prevent further injury or damage.

34.2.2 Except as authorized by the IC in charge of the emergency, no individuals shall be permitted to cross barriers.

34.2.3 Individuals shall not obstruct the operations of the FD or disobey any command of the IC or any order of a police officer assisting the FD.

34.2.4 The IC has the authority to direct personnel and/or organizations to supply equipment, manpower, and apparatus deemed necessary to mitigate emergency conditions.

34.3 LaRC Security Service Communication Center (SSCC)

34.3.1 SSCC shall:

- a. Dispatch the FD and other emergency responders where needed to mitigate the threats of fire, smoke, hazardous materials, or other events that jeopardize personnel, property, or equipment.
- b. Facilitate communications and execute directives from the IC as required.
- c. Dispatch at least one security patrol to all fire or emergency medical calls to which the FD has been dispatched.
- d. Promptly notify the NASA Fire Chief of any matter involving fire protection, life safety, injury, hazmat event, loss of essential safety systems, or decrease in emergency response capability on Center.

APPENDIX A: DEFINITIONS

Approved. Acceptable to the Authority Having Jurisdiction (AHJ).

Approved Materials. Materials approved by Factory Mutual (FM) or listed with Underwriters Laboratories (UL).

Authority Having Jurisdiction (AHJ). The individual responsible for interpreting fire, building, and life safety related codes; determining intent; granting waivers; approving equivalencies, equipment, installations, facilities, tunnels, operations, and procedures; and determining personnel qualifications.

Building. Any structure, enclosure, facility, or portion thereof used or intended to be used for any use or occupancy.

Certificate of Beneficial Occupancy (CBO). A document issued by the AHJ attesting that an area or facility substantially complies with the applicable fire protection, life, and building safety requirements, but is not in full compliance with them.

Certificate of Final Occupancy (i.e., Certificate of Occupancy (CO)). A document signed by the AHJ attesting that an area, operation, or facility fully complies with all applicable OSHA, NFPA, IBC, IFB, IMC, IPC, FM, UL, NASA, and LaRC requirements on the date of issuance of the certificate.

Clean Room / Clean Zone. A room or space in which the concentration of airborne particles is controlled to within specifically defined limits.

Code of Record (COR). A set of technical and operational requirements, including Federal and state laws, as defined in contracts and Standards or Requirements Identification Documents (or their equivalent), that are in effect at the time a facility or item of equipment was designed or modified, and accepted by the LaRC AHJ.

Computer Room / Computer Area. A room, space, or area that contains electronic computers, data processing equipment, and/or servers with a special dedicated air conditioning system to maintain conditions in that space within defined limits.

Construction Projects. Work on new and existing facilities, including additions, alterations, demolitions, and modifications.

Equivalency. A variance issued by the AHJ that authorizes deviating modification from a particular requirement where the intent of the requirement is being met through alternate means that provide equal or greater levels of safety.

Evacuation Alarm. An indication of a condition communicated by electrical, visible, audible, wireless, or other means.

Facility Coordinator (FC). Individuals having responsibility to ensure the safe and successful operation of their assigned facility(ies) by providing oversight of the day-to-day operations, maintenance, and modifications.

Facility Safety Head (FSH). Individuals having responsibility to ensure the safety of their assigned facility(ies) by providing oversight of facility day-to-day operations, maintenance, and modifications.

Fire alarm. A system or portion of a combination of systems that consists of components and circuits arranged to monitor and annunciate the status of fire alarms or supervisory signal-initiating devices and to initiate the appropriate response to those signals.

Fire Area. An area bounded by construction with a minimum fire-resistance rating of two hours with openings protected by fire-rated doors, fire dampers, and penetration seals. Boundaries of exterior fire areas or yards are determined by the AHJ.

Fire Hazard Analysis. A comprehensive assessment of building, fire, and life safety risks and mitigation strategies within individual fire areas or facilities.

Fire Load. The total energy content of combustible materials in a building, space, or area including furnishing and contents and combustible building elements expressed in megajoules (MJ).

Fire Loss. The dollar cost of restoring damaged property to its pre-fire condition. In determining loss, the estimated damage to the facility and its contents includes replacement cost less salvage value. Losses will exclude costs of restoring (1) property that is scheduled for demolition, (2) property that is decommissioned and not carried on the books as value, and (3) property that has no loss potential. Personnel performing the loss estimate should include the cost of decontamination and cleanup, the loss of production or program continuity, the indirect costs of fire extinguishment (e.g., damaged fire department equipment), and consequent effects on related areas in all property loss amounts.

Fire Protection. A broad term that encompasses all aspects of fire safety, including facility construction and fixed facility fire protection features, fire suppression and detection systems, fire water systems, emergency process safety controls, emergency firefighting operations (i.e., fire department), fire protection engineering (FPE), and fire prevention. Fire protection is concerned with preventing or minimizing the direct and indirect consequences of fire on people, property, and programs. By extension, fire protection also includes aspects of the following perils as they relate to fire protection: explosion, natural phenomena, and smoke and water damage from fire.

Fire Protection Program. A program that establishes the requirements, responsibilities, and organizational interfaces for implementing policy in the areas of fire protection, fire prevention, and life safety.

Fire Protection System. Any system designed and installed to detect, control, or extinguish a fire; to limit fire damage; to alert occupants and/or the fire department that a fire has occurred; or to otherwise enhance life safety.

Fire Protection System Impairment. A degradation in the capability of a fire protection system or portion thereof.

Fire Watch. The monitoring of potentially hazardous conditions or operations by dedicated personnel during hot work activities, where fire/life safety systems are impaired or other circumstances warranting this protective measure, as found necessary by the AHJ.

Graded Approach. By graded approach, LaRC intends that the depth of detail required and the magnitude of resources expended for a particular action are commensurate with the action's relative importance to safety, environmental compliance, safeguards and security, programmatic importance, and/or other facility-specific requirements.

Improved Risk. Generally, an improved risk property is one that would qualify for complete insurance coverage by the Factory Mutual System, the Industrial Risk Insurers, and other industrial insurance companies that limit their insurance underwriting to the best-protected class of industrial risk. This term also implies that qualified fire protection engineering judgment has been used to obtain the highest economically justifiable level of industrial loss prevention. The most evident characteristic of an improved risk property is the existence of reliable, automatic fire extinguishing systems throughout all facilities of combustible construction or content where the facility is vital to operational continuity or may experience a large property loss from a fire in the absence of an automatic extinguishing system.

Incident Command. The Incident Command is responsible for all incident activities, including the development of strategies and tactics, and the ordering and release of resources. The Incident Command has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

Information Technology Equipment (ITE). Equipment and systems rated 600 volts or less that are used for creation and manipulation of data, voice, video, and similar signals that are not communications equipment. ITE is normally found in offices or other business establishments and similar environments classified as ordinary locations.

Information Technology Equipment Room. A room within the ITE area that contains the ITE.

MAXIMO. Web-based product used by NASA and maintenance to track work orders, plan jobs, and track costs of jobs.

Maximum Possible Fire Loss. The value of property, excluding land, within a fire area, unless a fire hazards analysis demonstrates a lesser (or greater) loss potential. This assumes the failure of both automatic fire suppression systems and manual firefighting efforts.

Muster Point. An area identified by the facility owner and/or Facility Safety Head with concurrence from the AHJ for facility personnel to safely gather following an evacuation.

Products of Combustion. Heat, smoke, sparks, and firebrands generated by burning.

Pyrophoric Material. A material that ignites spontaneously when exposed to air.

Structure. That which is built or constructed. The term "structure" is construed as if followed by the words "or portion thereof."

Temporary. (1) Not to exceed a period of six months; (2) A **fire load** that is not permanently installed or stored in a designated storage area. This includes items such as combustible shipping containers, packing, stored paper, or other flammable materials. This does not include hand carried items directly under an individual's control

such as toolboxes, work documents, personal protective equipment, and instrumentation devices.

Variance. Documented and approved permission to perform some act different than established requirements.

Waiver. Authorization to not comply with a specific safety-related requirement, and under certain circumstances, allow for an increased level of risk to personnel and/or property.

Wear. Local deterioration that is expected based on previous experience.

Work Order. A written request for maintenance work submitted on a work order form.

APPENDIX B: ACRONYMS

AED	Automated External Defibrillator
AHJ	Authority Having Jurisdiction
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
CBO	Certificate of Beneficial Occupancy
CO	Certificate of Occupancy
COD	Center Operations Directorate
FACP	Fire Alarm Control Panel
FC	Facility Coordinator
FD	Fire Department
FDC	Fire Department Connection
FEC	Facility Environmental Coordinator
FM	Factory Mutual
FSH	Facility Safety Head
FPR	Fire Protection Rating
GSA	General Service Administration
HAZWOPER	Hazardous Materials and Hazardous Waste Operations and Emergency Response
HEPA	High-efficiency Particulate Air Filtration
IA	Interagency Agreement
IC	Incident Command
IBC	International Building Code
IFC	International Fire Code
IH	Industrial Hygienist
IMC	International Mechanical Code

IPC	International Plumbing Code
IT&M	Inspection, Testing, and Maintenance
ITE	Information Technology Equipment
JOFOC	Justification for Other than Full and Open Competition
LaRC	Langley Research Center
LEL	Lower Explosive Limit
LP-Gas	Liquefied Petroleum Gas
LPR	Langley Procedural Requirements
MAQ	Maximum Allowable Quantities
NFPA	National Fire Protection Association
NOV	Notice of Violation
NPR	NASA Procedural Requirements
NRL	Naval Research Laboratory
OEOP	Office of Equal Opportunity Programs
OSHA	Occupational Safety and Health Administration
PHM	Potentially Hazardous Material
PIV	Post Indicator Valve
SDS	Safety Data Sheet
SFAB	Safety and Facility Assurance Branch
SLC	Signaling Line Circuit
SMAO	Safety and Mission Assurance Office
SPE	Standard Practice Engineer
SPEEB	Standard Practice Engineering and Environmental Branch
SSCC	Security Service Communication Center
STD	Standard Technical Document
UL	Underwriters Laboratories
USACE	United States Army Corps of Engineers
VESDA	Very Early Smoke Detection Activation

APPENDIX C: FIRE PROTECTION IMPAIRMENTS

- a. Promptly report all impairments of LaRC fire alarm systems, fire suppression systems, control valves, initiating devices, notification appliances, supervisory equipment, water supply, power supply, communications equipment, gas monitoring systems, or other fire and life safety systems or parts thereof to the Security Service Communication Center (SSCC)) located at Facility 1248, NASA Fire Station, by calling (757) 864-5500. Information required:
 - (1) Name of individual reporting impairment;
 - (2) Company, organization, or work group;
 - (3) Telephone number;
 - (4) Equipment impaired;
 - (5) Equipment location (e.g., facility number, room, or space number);
 - (6) Reason for impairment/outage;
 - (7) Date and time equipment tagged out;
 - (8) Anticipated date and time equipment to be placed back in service;
- b. Promptly notify SSCC when equipment is restored to service.