LPR 1710.11

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Langley Research Center

FIRE PROTECTION PROGRAM

National Aeronautics and Space Administration

RESPONSIBLE OFFICE: OFFICE OF SAFETY AND MISSION ASSURANCE

PREFACE

P.1 PURPOSE

This Langley Procedural Requirements (LPR) sets forth procedural requirements for the Langley Research Center (LaRC) Fire Protection Program. It defines the requirements of the Center's Fire Protection Program. This program includes the elements of 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. This LPR also provides guidance for government personnel in performing their responsibilities for this program.

P.2 APPLICABILITY

This directive is applicable to all employees, contractors and tenets at LaRC.

P.3 AUTHORITY

a. NPD 8700.1, "NASA Policy for Safety and Mission Success"

P.4 APPLICABLE DOCUMENTS

a. NPR 8715.3, "NASA General Safety Program Requirements"

b. NPR 8820.2C, "Design and Construction of Facilities"

c. NASA STD 8719.7, "Facility System Safety Guidebook"

d. NASA STD 8719.11, "Safety Standard for Fire Protection"

e. OSHA 29 CFR Part 1910 Subpart L, Fire Protection

f. ASME A17.1, "Safety Code for Elevators and Escalators"

g. NFPA 1, "Fire Code"

h. NFPA 70, "National Electrical Code"

i. NFPA 101, "Life Safety Code"

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P.5 MEASUREMENT/VERIFICATION

None

P.6. CANCELLATION

LPR 1710.11 Dated July 22, 2004

Original signed on file

Stephen G. Jurczyk
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CHAPTER 1

1. INTRODUCTION

1.1 FOREWORD

1.1.1 Langley Research Center (LaRC) management is committed to strive for excellence in the conduct of operations to ensure a fire-safe work environment. Work is performed at LaRC only when the risk of fire is as low as is reasonably achievable and when the people are provided with a fire-safe workplace. Facilities shall be designed and operated in a manner to minimize the adverse impacts of fire and its related perils to workers, the public, and the environment. Fire protection support activities are conducted in compliance with fire safety laws, National Aeronautics and Space Administration (NASA) directives, regulations, general industry practices, and in a manner appropriate for the associated hazards.

1.1.2 The establishment of a comprehensive LaRC fire protection program has as its goal to ensure that an adequate level of fire protection and life safety is maintained for personnel and property. This LPR was developed in order to achieve this goal and maintain a viable and effective fire safety program. Authority for the development and implementation of the LaRC Fire Protection Program is rooted in NPD 8700.1A, "NASA Policy for Safety and Mission Success"

1.1.3 Guidance for the development of this LPR was provided by:
a. NPR 8715.3, " NASA General Safety Program Requirements"
b. NASA STD 8719.11, "Safety Standard for Fire Protection"
c. NPR 8820.2C, “Design and Construction of Facilities”

1.1.4 NPR 8715.3 requires each NASA organizations to comply with the most current requirements of the following documents:
a. Any applicable Federal Documents
b. IBC International Building Codes (Building, Mechanical, Fire, Plumbing)
c. 29 CFR Part 1910 Subpart L, Fire Protection
d. Any applicable NASA Documents
e. Safety Standard for Fire Protection – NASA STD 8719.11
f. Facility System Safety Manual – NASA STD 8719.7
g. Any applicable NFPA Codes and Standards and their Appendices
h. NFPA 101, Life Safety Code
i. NFPA 70, National Electrical Code
j. NFPA 1, Fire Code
k. ASME A17.1, Safety Code for Elevators and Escalators

1.1.5 NASA STD 8719.11 expands on the policy and guidelines for fire protection listed in NPR 8715.3. NASA STD 8719.11 is a compilation of pertinent requirements from OSHA, NFPA, as well as unique NASA requirements. Compliance with this standard is mandatory for

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all NASA Field Installations. This Standard establishes fire protection requirements for NASA facilities in addition to those provided in NPR 8820.2C. NPR 8820.2C adds the following documents to the list of those stated previously that shall be adhered to:

a. Code of Federal Regulations (CFR)
b. Factory Mutual (FM) Data Sheets and Approval Guides

1.1.6 LaRC management is responsible for correcting work conditions and employee actions that may contribute to the occurrence of fire. It also is responsible for informing employees, contractors, and relevant authorities of known potential fire hazards encountered in the workplace; for training individuals and making equipment and appropriate job procedures available so that each assignment can be completed in a fire-safe manner; and for ensuring that contractors apply fire protection requirements fully complying with LaRC directives.

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CHAPTER 2

2. PROGRAM MANAGEMENT

2.1 FIRE PROTECTION STATEMENT

2.1.1 PURPOSE

2.1.1.1 This LPR outlines the procedural requirements necessary for the LaRC fire protection program to meet the NASA fire protection criteria and NASA-mandated fire protection codes and standards.

2.1.2 SCOPE

2.1.2.1 This directive shall apply to the implementation of the fire protection program in all organizations at LaRC and to all contractors.

2.1.3 REQUIREMENTS

SFAB/Fire & Emergency Preparedness Group shall develop, manage and implement the LaRC fire protection program.

2.1.3.1 The LaRC fire protection program shall include the following elements: management; administration; documentation; training; system and facility design and construction; fire protection engineering (FPE); fire prevention; annunciation; confinement; suppression; fire department organization; inspection, testing, and maintenance; and quality assurance. The functional/organizational structure of the LaRC Fire Protection Program is shown in Figure 2.1.

2.1.3.2 The fire protection program shall provide and maintain a level of fire protection at LaRC which meets and/or exceeds the objectives and criteria stated in NASA STD 8719.11, "Safety Standard for Fire Protection".

2.1.3.3 The objectives and the approach of the program shall entail the following:

a. Complete facility survey/risk analysis to identify fire protection and life safety deficiencies within the LaRC facilities. This shall be accomplished by the performance of FPE surveys and more detailed fire hazard analyses (FHAs) of facilities and hazards as warranted.
b. Reporting and tracking of fire protection deficiencies. This shall be accomplished by the fire protection organization maintaining a database of FPE deficiencies, recommended corrections, and status of corrections.
c. Appropriate review and correction of fire safety violations.
   (1) This shall be accomplished by a formal fire protection design review process to facilitate fire protection and life safety deficiency resolution in the earliest design phases.

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(2) This process shall aid in preventing vital programs or projects from suffering unacceptable delays as a result of fire or its perils.

d. Submittal of Construction of Facilities (CoF) projects to correct fire protection deficiencies. This shall be addressed by Center Operations Directorate (COD) submitting drawings, specifications, and documentation to the Authority Having Jurisdiction (AHJ) for review and approval. The AHJ shall be a member of the COD's design review panels.

e. Control of flammable materials and hazardous operations to ensure that fire does not cause an on-site or off-site release of hazardous material that may threaten public health and safety or the environment. This shall be addressed through the design review process, support of the Potentially Hazardous Materials (PHM) Committee, the Safety Permit Program, the FPE survey program, and a fire prevention program.

f. Review of maintenance programs for fire protection equipment and systems. This shall be accomplished through a documented inspection, testing, and maintenance program of fire protection systems and equipment, as well as a documented improvement system to follow.

g. Facility fire inspection and fire safety training. SFAB/ Fire & Emergency Preparedness Group shall conduct fire inspections of the LaRC facilities. SFAB/ Fire & Emergency Preparedness Group shall conduct training to LaRC employees, on fire prevention programs for the control of housekeeping, combustible loading, hot work operations, hazardous materials, and ignition sources such as smoking and portable heating devices.

h. Proper functioning of the field installation fire department and/or coordination with the responsible local fire department. The Fire Chief will maintain or enter into agreements with Hampton, Virginia and Langley Air Force Base emergency services and fire departments. The objective of these agreements is to provide fully staffed, trained and equipped fire response forces for fire suppression, aircraft emergencies, emergency medical services, prefire planning, inspection services, and specialized fire safety training.

i. Investigation and reporting of fires. This shall be accomplished through LaRC Fire Department operations and the LaRC Fire Chief.

j. Development of emergency action plans and a field installation fire protection program plan and policy statement.

k. Designation of an authority having jurisdiction (AHJ). The responsibility of the AHJ is identified in Section 3.1

l. Compliance with local, state, and federal laws, national codes, and criteria for fire protection, as well as ensuring implementation of operational fire protection devices. This shall be addressed through the design review process, FPE survey program, more detailed Fire Hazard Analyses as warranted, and direct fire protection technical support to projects and operations.

m. Assistance in ensuring the adequacy of design from a code compliance, contractual, and cost benefit standpoint for major construction projects. This shall be accomplished through an established fire protection design review process and a design-based Fire Hazard Analysis, as warranted.

n. Review of facility design drawings for inclusion of adequate fire protection features and systems and for compliance with applicable codes and criteria. This shall be

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accomplished by establishing requirements that provide an acceptable degree of life safety to facility personnel; by providing a reliable water supply and water supply system (source, storage facilities, pumps, valves, and hydrants) of sufficient capacity for the maximum credible fire; by developing and maintaining Fire Hazard Analyses for new facilities; and by providing automatic suppression and detection systems in all areas subject to serious property damage and/or program interruption.

o. Review of all contractual documents for fire protection specifications. This shall be accomplished through an aggressive and documented fire protection design review process and the requirement to have contractual documents reviewed and approved by the Safety and Mission Assurance Office (SMAO).

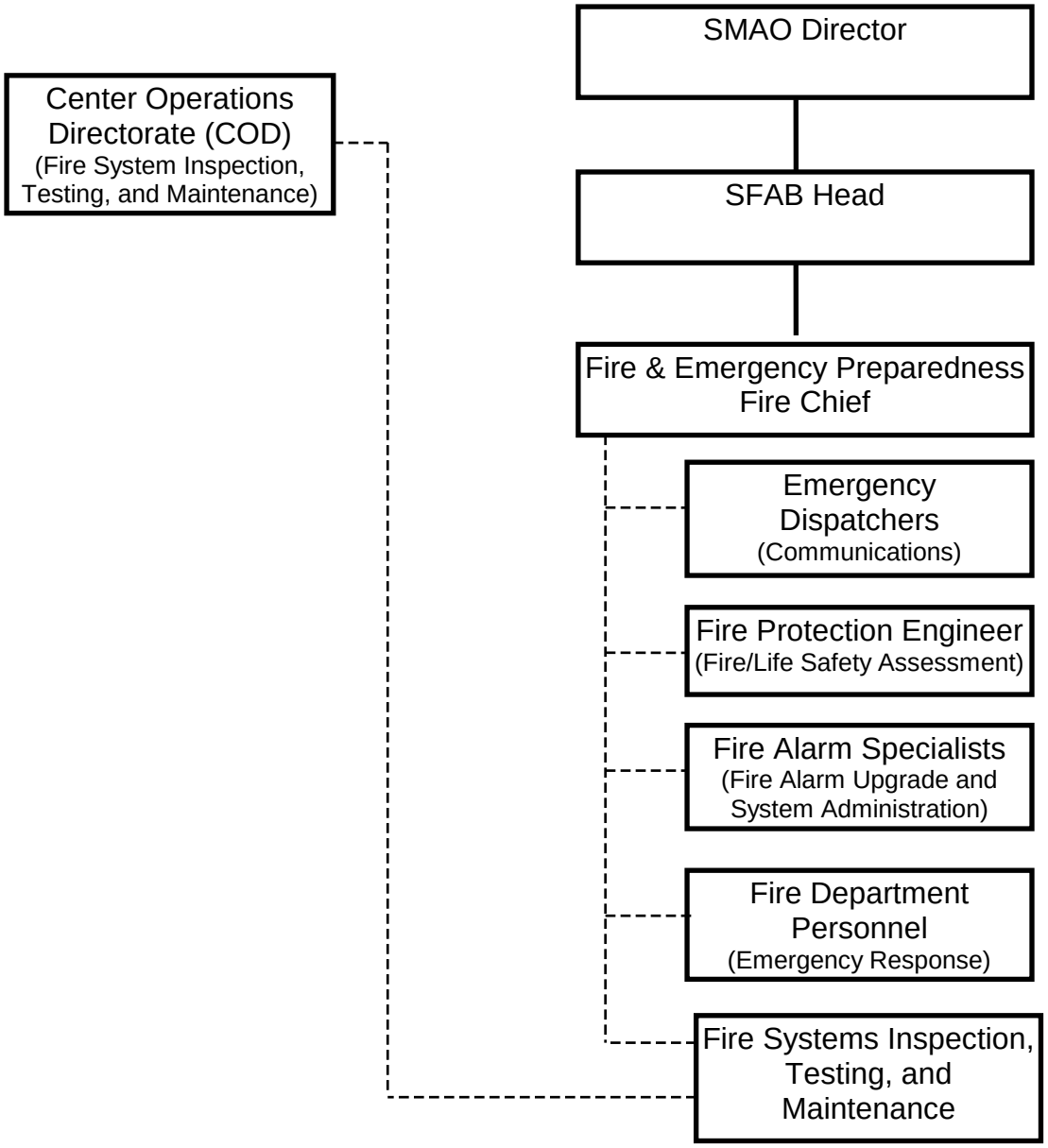

Figure 2.1, Functional/Organizational Structure of the Fire Protection Program.

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2.1.4 RESPONSIBILITIES

2.1.4.1 The LaRC Fire Chief shall have the overall management responsibility for the fire protection program.

2.1.4.2 The LaRC Fire Chief shall:

a. Plan, direct, and execute a comprehensive fire protection program for LaRC, in accordance with the criteria established in NASA STD 8719.11.
b. Formulate, implement, maintain, and assess the fire protection program.
c. Provide and maintain the necessary staffing and resources for the program.
d. Plan, organize, direct and control the fire protection program.
e. Provide and maintain a strong, competent fire protection staff.
f. Periodically assess the fire protection program.
g. Work as the Centers AHJ for fire protection and life safety as per section 3.1

2.1.4.3 Center Operations Directorate (COD) shall have the LaRC AHJ on the Preliminary Design Review (PDR) and the Critical Design Review (CDR) for the approval of designs for compliance with this LPR and its referenced documents.

2.1.4.4 COD shall have the AHJ sign all construction drawings and have the AHJ support in the resolution of problems related to fire protection.

2.1.4.5 All Associate Directors, Organizational Unit Managers, and workers shall be directly responsible for the fire safety of all personnel and property within their respective areas of operation.

2.2 FIRE PROTECTION ISSUES MANAGEMENT

2.2.1 PURPOSE

2.2.1.1 This section establishes the process and requirements for tracking corrective actions relative to fire protection findings resulting from audits and surveys. This shall include inspections, surveys, assessments, and evaluations.

2.2.3 SCOPE

2.2.3.1 This section shall apply to all fire protection findings resulting from audits and surveys at LaRC.

2.2.4 REQUIREMENTS

2.2.4.1 Internal Fire Protection Surveys are conducted under the direction of the LaRC AHJ

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2.2.4.1.1 The LaRC AHJ shall ensure that the required fire protection engineering (FPE) surveys are performed according to Section 9.1:

a. Forward copies of the surveys to the responsible Facility Coordinator and/or Facility Safety Head for resolution of deficiencies.
b. Discuss with the Facility Coordinator and/or Facility Safety Head, potential corrective actions for identified deficiencies. Additionally, ensure that interim compensatory measures are in place as warranted.

2.2.4.1.2 The LaRC AHJ shall categorize, consolidate, and track deficiencies according to established protocol and enter the following information into a deficiency tracking system:

a. Violation number
b. Facility number
c. Year
d. Type of violation (life safety, fire system deficiency, other specified code deficiency, NASA fire protection criteria noncompliance, housekeeping deficiency, or noncompliance with a good fire protection practice)
e. Fire protection ranking of violation
f. Violation description
g. Recommendation(s)/interim compensatory measures if warranted

2.2.4.1.3 The responsible Facility Coordinator and/or Facility Safety Head shall notify the LaRC Fire Chief when the corrective actions are complete.

2.2.4.1.4 The LaRC AHJ or an appointed representative shall review and validate the corrective action to ensure that it was satisfactorily completed.

2.2.4.1.5 The LaRC AHJ then shall close the deficiency in the database, as well as notifying the responsible Facility Coordinator and/or Facility Safety Head that the deficiency has been closed.

2.2.4.1.6 The LaRC AHJ shall maintain documentation relative to all corrected fire protection related findings for surveys.

2.2.4.1.7 Annual fire and Life Safety Inspection documentation shall be maintained in the ATS system

2.2.4.2 Annual Inspections are conducted by the LaRC Fire Department using the Audit Tracking System (ATS)

2.2.4.2.1 LaRC Fire Department management shall:

a. Record deficiencies on ATS stipulated under Section 10.7.
b. Contact the Facility Coordinator and/or Facility Safety Head to advise that a fire inspection will be performed.
c. Provide the LaRC Fire Chief with a copy of the inspection report using ATS.

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2.2.4.2.2 The LaRC Fire Chief shall serve as the primary point of contact for external fire protection related audits and shall:

a. Aid in coordination of the audits and question resolution.
b. Assist with resolution of deficiencies but is not responsible for corrective actions unless such actions specifically involve a function under his/her control. This responsibility shall lie with the Facility Coordinator and/or Facility Safety Head.
c. Enter the deficiencies into the fire protection database for tracking purposes.
d. Validate closure of deficiencies when notified by the Facility Coordinator and/or Facility Safety Head.

2.2.5 RESPONSIBILITIES

2.2.5.1 LaRC Fire Chief shall:

a. Issue requirements for compensatory measures that may be necessary until deficiency resolution (e.g., facility evacuation, fire watch).
b. Validate deficiency correction and close out the deficiency in ATS when notification is received from the facility coordinator and/or facility safety head.
c. Review ATS inspection report and forwards the report to the respective facility coordinator and/or facility safety head using the ATS system
d. Report fire protection deficiencies observed during audits and validate implementation of corrective actions as delineated in this protocol.
e. Ensure that Annual Inspection are performed in accordance with this Section

2.2.5.2 LaRC AHJ shall:

a. Report fire protection deficiencies observed during Surveys and validate implementation of corrective actions as delineated in this protocol.
b. Ensure that Surveys are performed in accordance with this Section

2.2.5.3 Facility Coordinator and/or Facility Safety Head shall:

a. Achieve resolution of all identified deficiencies
b. Through the ATS system notify the LaRC Fire Chief when deficiencies are corrected.
c. Ensure that all interim compensatory measures are being performed.
d. Coordinate corrective actions relative to fire protection findings with the LaRC Fire Chief.
e. Seek funding to resolve deficiencies, as warranted.
f. Notify the LaRC Fire Chief when the corrective action is complete
g. Perform tasks as delineated in this section.
h. Aid with deficiency resolution and performance of any other tasks assigned within this section.

2.2.5.4 LaRC Fire Department shall report fire protection deficiencies observed during facility inspections in the ATS system.

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2.3 FIRE PROTECTION FORMAL WAIVER

2.3.1 PURPOSE

2.3.1.1 This section identifies the methodology necessary to request formal waiver from a mandated NASA fire protection policy, code, or standard.

2.3.2 SCOPE

2.3.2.1 This section shall apply to all organizations at LaRC which operate facilities or equipment that may warrant a formal waiver.

2.3.3 REQUIREMENTS

2.3.3.1 If compliance with a specified code, standard, or mandated policy cannot be prescriptively achieved or the intent of the specified code, standard or policy cannot be achieved through performance based approach as described in NFPA and NASA STD 8719.11 through the LaRC AHJ a formal waiver may be requested.

2.3.3.2 Any request for a formal waiver of requirements from this LPR, NASA Fire Protection Policy Code, or Standard shall be done in accordance with Langley LMS-CP-7151.

2.3.3.3 Any request for a formal waiver of requirements from this LPR, NASA Fire Protection Policy Code, or Standard shall be approved by the LaRC AHJ.

2.3.4 RESPONSIBILITIES

2.3.4.1 All LaRC organizations requesting a formal waiver from a mandated fire protection code, standard, and/or policy shall follow the requirements in LMS-CP-7151 and get the approval of the LaRC AHJ.

2.3.4.2 The LaRC AHJ shall review and approve or reject the formal waiver within the guidelines of LMS-CP-7151

2.4 FIRE PROTECTION RULINGS

2.4.1 PURPOSE

2.4.1.1 This section outlines the process for issuance of formal fire protection rulings by the LaRC AHJ pertaining to specific codes, standards, and amendments. Such fire protection rulings are promulgated to administer and implement the fire protection program and to provide clarification of language found within applicable regulating documents.

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2.4.2 SCOPE

2.4.2.1 This section shall apply to formal fire protection ruling made by the LaRC AHJ for applicable fire protection codes, standards, and amendments implemented at the LaRC.

2.4.3 REQUIREMENTS

2.4.3.1 General

2.4.3.1.1 Formal fire protection rulings shall provide formal explanations and guidance pertaining to the meaning or intent of any specific provision or provisions of any regulatory document affecting the LaRC fire protection program.

2.4.3.1.2 All requests for formal rulings on the intent of NASA-specific criteria, codes, standards, and other relevant fire, life safety, and facility requirements shall be made directly to the NASA Fire Chief who serves as the Authority Having Jurisdiction (AHJ) at LaRC

2.4.3.1.3 All requests for formal rulings on the intent of NASA-specific criteria, codes, standards, and other relevant fire, life safety, and facility requirements shall contain the following information:

a. Name of person making request for a formal ruling
b. Company, organization, work group
c. Cite applicable edition of NASA-specific criteria, code, standard, or requirement
d. Cite specific paragraph or section number where clarification, interpretation, or ruling is being requested

2.4.3.2 Limitations

2.4.3.2.1 A statement, written or oral, that is not processed in accordance with this section shall not be considered the official position of the LaRC AHJ or any of the fire protection designees

2.4.3.2.2 A statement, written or oral, that is not processed in accordance with this section shall not be considered to be, nor relied upon as, a formal ruling.

2.4.3.3 Method for Requesting Formal Fire Protection Rules

a. A request for a formal rule shall be directed to the LaRC AHJ.
b. The request shall include a statement which details specific references to a single problem and identifies the portion (e.g., article, section, paragraph) of the document and edition of the document on which a formal rule is requested.
c. Such a request shall be in writing.
d. Such a request shall indicate the business interest of the requester.
e. A request involving an actual field installation shall state this. All parties involved in a request involving an actual field installation shall be named and notified.

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2.4.3.4 Process

a. The LaRC AHJ, after consultation with the appropriate staff, shall determine if the request for a formal rule shall not be processed.
b. The LaRC AHJ and\or an appropriate staff having expertise in the document or portion covering the subject under consideration shall review the request, codes requirements, and supporting documentation.
c. The AHJ shall involve Standard Practice Engineer SPE, Safety Committees, and other experts who may have expertise for the subject ruling
d. A request for a formal rule may be rephrased. The rephrased version and any pertinent background information shall be sent to the requester and all parties named in the request for a formal rule.
e. A deadline for receipt of agreement shall be established.

2.4.3.4.1 Approval of Formal Fire Protection Rulings

a. If the required agreement is secured, the requester, the staff, and all named parties shall be notified by the LaRC AHJ.
b. Formal fire protection ruling shall be made in writing to the requester and all parties affected by the ruling.
c. A copy of the ruling shall be kept by the LaRC AHJ

2.4.3.4.2 Applicability

2.4.3.4.3 Any formal ruling issued shall apply to the edition of the specific codes, standards, and amendments for which the ruling is made and to any other edition of the document where the text is identical to the text of the edition on which the formal rule was rendered unless deemed inappropriate by the LaRC AHJ.

2.4.4 RESPONSIBILITIES

2.4.4.1 All LaRC organizations requesting a formal rule of a mandated fire protection code, standard, and/or policy shall submit the request to the LaRC AHJ with the information outlined in this Section.

2.4.4.2 The LaRC AHJ shall review and approve or reject all requests for formal rulings brought before him.

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CHAPTER 3

3. ADMINISTRATIVE ASPECTS/FEATURES

3.1 AUTHORITY HAVING JURISDICTION

3.1.1 PURPOSE

3.1.1.1 This section establishes the authority having jurisdiction (AHJ) for the administration and enforcement of fire protection codes, standards, and recommended guides and practices.

3.1.2 SCOPE

3.1.2.1 This section shall apply to all fire protection issues, codes, standards, at LaRC.

3.1.3 REQUIREMENTS

3.1.3.1 General

3.1.3.1.1 The SFAB Head may delegate an individual to be the AHJ for all fire protection matters.

3.1.3.1.2 The individual delegated by the SFAB Head as the AHJ is the LaRC Fire Chief, and he shall assume such powers as necessary for the administration and enforcement of the LaRC fire protection program.
a. A memo shall be signed by the Center Director formally naming the AHJ.

3.1.3.1.3 LaRC Office of Security Services (OSS) and other enforcement agencies shall have authority to render necessary assistance in the enforcement of the fire protection program when requested to do so by the AHJ.

3.1.4.1 Authority of the AHJ

3.1.4.1.1 The AHJ or designee shall be authorized to inspect any facility or premises for dangerous or hazardous conditions or materials.

3.1.4.1.2 The AHJ shall order any person(s) to remove or remedy dangerous or hazardous conditions or materials.

3.1.4.1.3 Where conditions exist and are deemed hazardous to life and property by the AHJ, he or she shall have the authority to abate such hazardous conditions that are in violation of the fire protection program.

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3.1.4.1.4 The AHJ shall investigate the cause, origin, and circumstances of any fire, explosion, or other hazardous condition:

a. The AHJ shall take custody of all physical evidence relating to the cause of the fire, explosion, or other hazardous condition.
b. Information that may relate to trade secrets or processes shall not be made part of the public record except as may be directed by a court of law.

3.1.4.1.5 The AHJ shall access plans and specifications to ensure compliance with applicable codes and standards.

3.1.4.1.6 When any construction or installation work is being performed in violation of the plans and specifications approved by the AHJ, a NASA LaRC Notice of Violation (Contractor) shall be issued to the responsible party to stop work on the portion of the work that is in violation

3.1.4.1.7 The notice shall state the nature of the violation
3.1.4.1.8 No work shall be continued on that portion until the violation is corrected.

3.1.4.1.9 The AHJ shall be notified when the installation is ready for inspection and conduct the inspection within a reasonable time. Whenever any installation subject to inspection prior to use is covered or concealed without having first been inspected (e.g., buried piping), the AHJ may require that such work be exposed for inspection.

3.1.4.1.10 The AHJ shall have the authority to approve alternative materials or methods of construction provided (1) the proposed alternative is satisfactory and complies with the intent of the provisions of the fire protection program; and (2) the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in the fire protection program in quality, strength, effectiveness, fire resistance, durability, and safety:
a. Sufficient technical data shall be submitted to substantiate the proposed installation of any material or assembly.
b. If the AHJ determines that the evidence submitted is satisfactory proof of performance for the proposed installation, he or she shall approve such an alternative subject to the provisions of the fire protection program.
c. The cost of all tests, reports, and investigations required under this provision shall be paid by the applicant.
d. Supporting data, where necessary to assist in the approval of all materials or assemblies not specifically provided for in the fire protection program, shall consist of valid research reports from approved sources.

3.1.4.1.11 The AHJ shall order the immediate evacuation of any facility deemed unsafe and present an imminent danger to facility occupants. This authority extends to multiple facilities or to the Entire Center.

3.1.4.1.12 The AHJ shall develop and implement a fire protection program as deemed necessary for the general welfare with respect to the potential fire hazards at LaRC.

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3.1.4.1.13 The AHJ shall ensure that appropriate or duly authorized fire safety education programs or public fire safety messages are disseminated to LaRC employees and contractors.

3.1.5 RESPONSIBILITIES

3.1.5.1 Center Director shall:
a. Designate the AHJ.
b. Ensure that the duties and authorities of the AHJ are developed.

3.1.5.2 Authority Having Jurisdiction shall:
a. Perform the duties delineated in this section.
b. Enforce the provisions of the LaRC fire protection program.

3.1.5.3 LaRC Fire Chief shall act as the AHJ for fire protection and life safety related issues. This includes all facilities, projects, programs and tests on Center or being used by NASA LaRC civil servants and contractors.

3.2 FIRE INVESTIGATION AND REPORTING

3.2.1 PURPOSE

3.2.1.1 This section identifies the requirements and describes the method of conducting fire investigations and preparing the investigation reports.

3.2.2 SCOPE

3.2.2.1 These requirements shall apply to all personnel designated to investigate fires, determine cause, and properly report their findings.

3.2.3 REQUIREMENTS

3.2.3.1 This section is not intended to cover every aspect of a fire investigation. However, certain steps shall be necessary to assure an accurate report of any fire, large or small. The statistics of a fire are vital in every respect. All facts shall be exposed.

3.2.3.2 Any information obtained from a knowledgeable person shall be considered very important, until otherwise determined.

3.2.3.3 Fire investigations and reports shall be performed and prepared in accordance with the STD8719.11 and NPR 8715.3.

3.2.3.4 The LaRC AHJ shall conduct the fire investigations with assistance from the LaRC Fire Department station officer, Security, Hampton Fire Department investigation unit, or other organizations as requested.

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3.2.3.5 Basic information relative to the facility at which the fire occurred shall be obtained, including the following:

a. Facility Number and Name
b. The specific location of the fire occurrence shall be identified.
c. Facility Function - The type of facility or the activity/function performed by the facility shall be reported.
d. Originator - The name, title, and telephone number of the person who obtained the information and documented the facts shall be included.

3.2.3.6 The response related information shall be identified and documented, including the following:

a. Method used to provide notification of the fire.
b. Beginning and ending recording index.
c. Individual notifying the LaRC Fire Department.
d. Fire related information provided during initial notification.
e. All responding vehicles/apparatus, including time out and time in.
f. Approach used; position of apparatus.
g. Whether or not equipment functioned properly.
h. Weather conditions and wind direction.
i. Extent of fire spread or containment.
j. Content or fire load, fuel, ventilation, and facility accessibility.
k. Equipment damage.
l. Fire fighter, pedestrian, or occupant injuries.
m. Amount of agent used to extinguish the fire.

3.2.3.7 The point of origin and cause of fire shall be determined and documented.

3.2.3.8 Photographs taken of the complete area shall be included.

3.2.3.9 The previous information and any other pertinent information shall be documented in a consistent, organized manner.

3.2.4 RESPONSIBILITIES

3.2.4.1 LaRC AHJ shall investigate all fires and follow these requirements in the performance of his or her duties.

3.2.4.2 Fire Department Station Officer shall assist in investigation of fires, as needed.

3.2.4.3 Security and Public Safety shall assist LaRC AHJ or designee in investigation of fires, as needed.

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CHAPTER 4

4. DESIGN CRITERIA

4.1 FIRE PROTECTION DESIGN CRITERIA

4.1.1 PURPOSE

4.1.1.1 This section identifies the fire protection design criteria for new facility designs, upgrades, and modifications.

4.1.2 SCOPE

4.1.2.1 This section shall apply to all designs, upgrades, and modifications to NASA-owned facilities.

4.1.2.2 This criteria shall be applied to NASA-leased facilities to the maximum extent permitted by the local building code or official.

4.1.3 REQUIREMENTS

4.1.3.1 Original Design Codes

4.1.3.1.1 The fire protection related codes and standards in effect when facility design commences (code of record) shall remain in effect for the life of the facility unless a significant hazard that endangers the facility occupants or the public is identified.

a. In these cases, the facility shall be upgraded to the current requirements of the applicable code or standard.
b. If the code of record cannot readily be determined, the Authority Having Jurisdiction shall stipulate the code to be utilized.

4.1.3.2 Current Codes

4.1.3.2.1 When upgrades or modifications are made, the current edition of the code shall apply to the upgrade or modification.

4.1.3.2.2 When substantial upgrades or modifications are made on fire protection systems, the entire system shall be upgraded to the current code or standard.

4.1.3.3 Equipment Testing and Approval

4.1.3.3.1 All fire protection designs shall use equipment that has been tested and listed or approved by a nationally recognized testing laboratory for its intended use.

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4.1.3.3.2 The LaRC AHJ shall issue written approval for substitute, equivalent items if no listed or approved item can be procured because the equipment has never been tested for fire protection use.

4.1.3.4 Equipment Compatibility

4.1.3.4.1 All equipment components specified in designs shall be compatible with existing equipment and installed as required by the applicable NFPA codes and standards.

4.1.3.5 Acceptance/Operating Test Procedures

4.1.3.5.1 If NFPA required tests are not available or acceptable to the AHJ, then a written acceptance tests or operating procedures shall be prepared and executed for all new system installations and/or modifications to verify that the systems perform as required.

a. Any deficiencies noted during the tests shall be documented and tracked until resolved or corrected.

4.1.3.6 Site-Specific Requirements

4.1.3.6.1 When site-specific guides or design specifications exist, they shall be included in all fire protection design packages as applicable.

4.1.3.7 Mandatory Design Criteria

4.1.3.7.1 Provided in each section of this document are the orders, codes, standards, and other applicable documents that shall be followed for all fire protection designs, modifications, upgrades, and other fire protection related activities.

4.1.4 RESPONSIBILITIES

4.1.4.1 LaRC AHJ (or Designee) shall ensure that design submittals are reviewed in accordance with and meet the design criteria listed herein and the referenced documents.

4.1.4.2 SFAB Head (or Designee) shall ensure that design submittals are reviewed in accordance with and meet the design criteria per LaRC Safety Requirements, NASA Safety Policies, and OSHA standards

4.1.4.3 Facility Coordinator and/or Facility Safety Head shall ensure the LaRC Fire Chief is made aware of any construction projects within their Facility.

4.1.4.4 Facility Coordinator and /or Facility Safety Head shall ensure that design submittals meet all applicable fire protection requirements their project or facility.

4.1.4.5 COD Shall have the Fire Chief\AHJ and the SFAB Head (or Designee) as panel members on all PDR and CDR Review Panels

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4.2 PROPERTY LOSS DESIGN CRITERIA

4.2.1 PURPOSE

4.2.1.1 This section provides requirements for limiting property loss from fire.

4.2.2 SCOPE

4.2.2.1 These requirements shall apply to all LaRC-managed facilities, operations, programs, and activities.

a. This shall include NASA-managed equipment and components located in leased facilities.

4.2.3 REQUIREMENTS

4.2.3.1 Minimum Requirements for Installing Automatic Fire Suppression Systems

a. Light hazard sprinkler systems are prohibited. Minimum ordinary hazard 0.15-gpm/sq.ft. density.
b. 5-psi safety factor for new sprinkler systems is required.
c. Quick response sprinkler heads are to be specified where appropriate are to be specified.
d. Sprinkler head is not required in elevator shaft.

4.2.3.2 Complete automatic fire suppression systems shall be provided and installed according to the applicable NFPA standards for the following:

a. All new permanent structures or renovations with total floor area involved if greater than 2,500 square feet.
b. All projects (regardless of funding sources) where the maximum credible fire loss (MCFL) will result in the loss of use of a vital structure or equipment for a period longer than that specified as acceptable by the program director.

4.2.3.3 When the criteria above do not apply, automatic fire suppression and/or detection may still be warranted based on any of the following factors:

a. Programmatic importance
b. Effects on operations
c. Cost vs. benefit
d. Exposure
e. Future conditions

4.2.3.4 A redundant fire protection system shall be provided when the maximum possible fire loss (MPFL) exceeds $50 million, to limit the loss to this figure, or in situations deemed appropriate by sound fire protection engineering judgment.

4.2.3.5 In some cases, a fully staffed, trained, and equipped on-site fire department with adequate water supply (including location of hydrants) and automatic means of notification (such as a smoke detection system installed per NFPA 72) shall serve as a redundant system.

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4.2.3.6 A redundant fire protection system and a 3-hour rated fire barrier or physical separation shall be provided when the MPFL exceeds $75 million, to limit the loss to this figure.

4.2.3.7 Fire protection water supply distribution systems for all new installations shall be looped to provide two-way flow, with sectional valving arranged to provide alternate water flow paths to any point in the system.

a. The exception, a single feed, shall be allowed, provided the system is reviewed and approved by AHJ.

4.2.3.7.1 The water supply for fire protection shall have a minimum supply duration of 2 hours.

4.2.3.7.2 New primary distribution mains in no case shall be smaller than 12 inches.

4.2.3.7.3 Building/facility loops shall be 8 inches or larger.

4.2.3.7.4 Fixed suppression feeds in no case shall be smaller than 6 inches.

4.2.3.8 New structures shall be of noncombustible or fire resistive construction.

4.2.3.8.1 Materials used in renovations shall also be of noncombustible construction.

4.2.3.8.2 Allowances for a limited amount of combustible trim in accordance with NFPA 101 shall be permitted in the majority of circumstances.

4.2.3.9 Portable structures shall comply with Section 8.4, “Fire Protection for Portable Structures.”

4.2.3.10 Electronic computer systems shall comply with Section 8.10, “Fire Protection for Computer Facilities.”

4.2.3.11 All fire alarm systems shall meet as a minimum the requirements listed in the IBC and NFPA 72. The LaRC AHJ can require addition fire protection detection and suppression based on the hazard of a facility, project, or equipment.

a. All new fire alarm systems shall be UL listed and compatible with the Notifier Base Center fire alarm system known as EARS.
b. Upgrade smoke detectors from ionization to photoelectric technology in order to reduce false alarms and increase overall reliability.
c. An alarm strobe light shall be added to the exterior of the facility on the side of the facility facing the main road.
d. When a facility does not have total smoke direction throughout the facility the 15ft spacing from a wall and 30ft spacing apart for smoke detectors shall be maintained even in hallways.
e. Smoke detection is not required in elevator shaft.

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4.2.3.12 When fire protection systems are installed in facilities on the LaRC site, they shall be compatible with and connected to the site wide fire alarm system.

4.2.3.13 Special hazards unique to site operations and not addressed by mandatory codes or standards shall be protected per NASA STD 8719.11 and/or other criteria as outlined by Factory Mutual (FM) or Industrial Risk Insurers (IRI).

4.2.3.14 The design of fire protection systems to withstand seismic events shall be according to the applicable NFPA standard, except as required by other criteria for safety class equipment.

4.2.4 RESPONSIBILITIES

4.2.4.1 Project Engineer and/or Facility Coordinator/Facility Safety Head shall ensure that all facilities, operations, programs, and activities are designed and built according to the requirements of this section.

4.2.4.2 LaRC AHJ shall require compliance with this LPR and its referenced documents.

4.3 FIRE PROTECTION DESIGN/DOCUMENT REVIEW PROCESS

4.3.1 PURPOSE

4.3.1.1 This section delineates the documents requiring LaRC AHJ or designee review.

4.3.2 SCOPE

4.3.2.1 This section shall apply to the review of work orders/job packages, preliminary planning documents, and design documents for construction projects, including construction submittals for fire protection systems.

4.3.3 REQUIREMENTS

4.3.3.1 Work Orders/Maintenance Job Packages

4.3.3.2 LaRC AHJ or Designee shall perform fire protection review of work orders provided by the Research Facilities Management Office for fire protection and life safety concerns.

a. Sign the work order package if, after reviewing work orders, it is determined that there are no fire protection or life safety concerns or that such concerns are adequately addressed.

b. Note special fire protection/life safety/building safety/system safety requirements or unaddressed concerns in writing as deemed necessary to indicate additional action required before plans are acceptable.

c. Make sure appropriate Safety and SPE personnel have seen package before signing as approved

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d. Sign the review form after appropriate action has been taken to correct/address the noted concerns.

4.3.3.3 Work shall not commence until work orders are signed by the LaRC AHJ (or Designee) and the SFAB Head (or Designee).

4.3.3.4 Preliminary Planning Documents

4.3.3.5 COD shall submit preliminary planning documents and/or drawings for review at the earliest possible time.

4.3.3.6 LaRC AHJ or Designee shall:

a. Perform fire protection reviews of all preliminary planning documents including the following:
   (1) Data sheets
   (2) Conceptual design reports
   (3) Project design standards
   (4) Conceptual design drawings
   (5) Drawings and specifications
b. Prepare and submit written comments on the fire protection review comment record.
c. Consult with document originator to clarify review comments, as necessary.

4.3.3.7 Design Documents

4.3.3.8 COD shall submit preliminary planning documents, including sketches, plot plans, drawings, calculations, and other pertinent design data for review.

4.3.3.9 LaRC AHJ or Designee shall:

a. Perform fire protection reviews of all design documents including:
   (1) Design criteria reports
   (2) Design/Construction criteria
   (3) Design basis documents (including fire hazard analyses)
   (4) Job plans
   (5) Quality Control checklist
   (6) Design calculations (related to fire protection)
   (7) Preliminary safety analysis reports
   (8) Fire hazard analysis (To the existent required)
b. Prepare and submits written comments.
c. Consult with document originator to clarify review comments, if necessary.

4.3.3.10 Construction Submittals for Fire Protection Systems

4.3.3.11 COD or the Organization having worked performed shall submit construction submittals for review.

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4.3.3.12 LaRC AHJ or Designee shall:

a. Perform fire protection reviews of all construction submittals (shop drawings, catalog data including manufacturer's installation instructions, test plans, and special test reports) for all fire protection systems including the following:
   (1) Automatic sprinkler systems
   (2) Special extinguishing systems (e.g., carbon dioxide, dry chemical, water spray)
   (3) Underground fire mains, valves, etc.
   (4) Fire hydrants
   (5) Fire pumps and water storage structures
   (6) Fire detection and alarm systems
   (7) Safety interlocks for fuel-fired equipment
b. Sign construction submittals for fire protection systems which are acceptable. Reviewer may stamp plans as "Acceptable, With Comments." Submittal originator properly addresses comments.
c. Prepare and submit written comments for those submittals not acceptable.
d. Consult with document originator to clarify review comments, as necessary.

4.3.4 RESPONSIBILITIES

4.3.4.1 COD shall:

a. Submit work order, preliminary planning documents for construction projects, design document for construction projects, and construction submittals for fire protection systems for review by LaRC AHJ or designee.
b. Initiate comment resolution and ensures that prompt action is taken with the design team to resolve comments prior to permitting work to commence.
c. Have final document, drawing, or function approval signed by AHJ.
d. Submit work order, preliminary planning documents for construction projects, design document for construction projects, and construction submittals for fire protection systems for review by SFAB Head or designee.

4.3.4.2 LaRC AHJ or Designee shall conduct the reviews as outlined in this section.

4.4 FACILITY MODIFICATIONS AND NEW FACILITIES AFFECTING FIRE PROTECTION AND/OR LIFE SAFETY ASPECTS

4.4.1 PURPOSE

4.4.1.1 This section delineates the criteria for facility modifications which affect fire protection and/or life safety aspects. It also establishes the requirements for the LaRC AHJ's participation in the facility acceptance process.

4.4.2 SCOPE

4.4.2.1 This section shall apply to the acceptance of modifications to existing facilities or new facilities.

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4.4.3 REQUIREMENTS

4.4.3.1 Facility Modifications Affecting Fire Protection and/or Life Safety Aspects

4.4.3.2 No modifications in the use or occupancy of any facility or portion thereof which could affect fire protection and/or life safety aspects shall be made without the approval of the LaRC AHJ.

4.4.3.3 Modifications which could affect fire protection and/or life safety aspects shall include (but are not limited to) the following:

a. Changes in the use of a facility.
b. Permit increases in the number of occupants within a facility or anytime the occupant load reaches its maximum limit.
c. Introduction of high-value and/or hazardous equipment, materials, or processes.
d. Changes to corridors, lobbies, exits, or other required means of egress components such as doors and door hardware.
e. Changes of any type to fire protection systems.
f. Elimination of facility walls and barriers or any portion thereof.
g. Rearrangements of structural components affecting the exit requirements.
h. Significant changes in existing utilities.
i. Addition of new utilities to an existing facility.
j. Changing of Floor plan.

4.4.3.4 Ordinary repairs may be made to any facility without requiring notice to the LaRC AHJ, provided the repair does not include any item listed above or fire detection or suppression systems.

4.4.3.5 Alterations or repairs shall not cause an existing facility to become unsafe or adversely affect the performance of the building.

4.4.3.6 The unaltered portion of the existing facility shall continue to comply with the fire protection related codes and standards in effect when the facility design commenced (code-of-record), provided the altered portion of the facility or work being completed conforms to Section 4.1 of this document.

4.4.3.7 Situations that present an unusual life safety hazard in the opinion of the LaRC AHJ, shall not be allowed to continue regardless of the code in effect at the time of facility construction.

4.4.3.8 Alterations shall be submitted and reviewed in accordance with Section 4.4 of this document prior to beginning work.

4.4.3.9 Modifications to an existing facility shall be inspected and accepted by the LaRC AHJ in accordance with Section 4.3.3.2 of this section.

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4.4.3.10 Facility Acceptance

4.4.3.11 Construction Supervisor or Contractor shall provide advance notice of facility acceptance to the Facility Coordinator/Facility Safety Head for existing facility modifications or to the project engineer for new construction.

4.4.3.12 LaRC AHJ shall:

a. Receive advance notification of the required preliminary facility walkthrough for facilities being released by the construction supervisor or contractor. A minimum advance notice of 5 working days is required to allow for scheduling of personnel.
b. Participate in the preliminary walkthrough of the facility.
c. Ensure that all fire protection systems have been accepted (i.e., successfully acceptance-tested) according to Section 5.6 of this document.
d. Develop a list of fire protection and life safety deficiencies or concerns.
e. Submit the list of deficiencies or concerns generated during the preliminary walkthrough to the responsible Facility Coordinator and/or facility safety head or project manager for existing facility modifications or to the project engineer for new construction.
f. Validate the closure of identified fire protection and life safety deficiencies and concerns.
g. Shall notify the Facility Coordinator/Facility Safety Head or the project engineer of proper closure of fire protection and life safety deficiencies and concerns.
h. Shall notify the Facility Coordinator/Facility Safety Head or the project engineer of remaining fire protection and life safety deficiencies and concerns.
b. Facility Coordinator/Facility Safety Head or Project Engineer shall notify the LaRC AHJ when all identified fire protection and life safety deficiencies and concerns have been corrected.

4.4.4 RESPONSIBILITIES

4.4.4.1 Facility Coordinator/Facility Safety Head or Project Engineer shall notify the LaRC AHJ when facility modifications or new construction is performed.

4.4.4.2 LaRC AHJ shall complete the duties outlined in this section.

4.4.4.3 Construction Supervisor or shall provide advanced notice of acceptance tests.

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CHAPTER 5

5. FIRE PROTECTION EQUIPMENT AND SYSTEMS (OPERATIONS AND RELIABILITY)

5.1 FIRE PROTECTION SYSTEM IMPAIRMENTS

5.1.1 PURPOSE

5.1.1.1 This section establishes a means to control fire protection system impairments.

Note: Fire protection system impairments are controlled by limiting impairments to those that are essential, by ensuring that the impairments are restored as quickly as possible, and by ensuring that adequate interim compensatory measures are specified and implemented during impairments.

5.1.2 SCOPE

5.1.2.1 This standard shall apply to all personnel who may impair a fire protection system at LaRC.

a. This standard shall not apply to impairments during the normal and usual preventive maintenance inspections and testing of fire protection systems as required by NFPA standards and LaRC standards.

b. If a fire protection system shall be left impaired following a normal preventive maintenance inspection or test, this impairment standard does apply.

5.1.3 REQUIREMENTS

5.1.3.1 Requests for fire protection system impairments shall be made to the LaRC Fire Chief and the Emergency Dispatcher Officer (EDO).

5.1.3.2 The impairment request shall be evaluated to determine the effect on the overall Center fire protection system.

5.1.3.3 The impairment request shall include the following:

a. Reason for the impairment.

b. Number of hydrants, sprinkler systems, detection systems, and other equipment affected.

c. Estimated duration of impairment.

d. Other sections or systems already out of service.

e. Impact on overall Center operation.

5.1.3.4 In an emergency, such as an underground main rupture, prompt action shall be taken to isolate the system.

a. Impairment requests in an emergency shall be done after the emergency has been mitigated.

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5.1.3.5 For an emergency impairment condition:

a. The maintenance personnel shall immediately report the condition to the EDO and duty officer.

b. The EDO shall notify the LaRC Fire Chief.

5.1.3.6 The EDO shall log the affected fire protection systems as out-of-service.

5.1.3.7 Before a fire protection system is shut off, interim protective measures to reduce the fire risk shall be taken.

a. An impairment plan shall be created by a fire protection staff member having knowledge in the system and approved by the AHJ.

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

a. If the impairment involves a fixed system (such as automatic sprinkler or standpipe systems), work shall continue around the clock until the system is returned to service.

5.1.3.9 If a fire occurs, the fire watch shall notify the LaRC Fire Department.

5.1.3.10 If the impairment continues after normal working hours, the AHJ may request for OSS to perform fire watch duties shall be made.

5.1.3.11 Any valve affected by the impairment shall be tagged. 1The fire systems maintenance personnel shall prepare a red tag in accordance with LPR 1710.10, "Safety Clearance Procedures."

5.1.3.12 If additional protection is required, temporary feed lines (such as temporary piping, hose lines, or electrical service) shall be installed.

5.1.3.13 The EDO shall enter the following information in a manner approved by the NASA AHJ:

a. Date of impairment.

b. Time of impairment (military).

c. Equipment tagged out.

d. Reason for impairment.

e. Interim protective measures.

5.1.3.14 The fire system maintenance personnel shall check repair progress, including tagged equipment, at least once per shift.

5.1.3.15 When the fire protection system is restored, the fire system maintenance personnel shall inspect the affected system to ensure that equipment is operational.

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5.1.3.16 A 2-inch drain test shall be conducted on sprinkler systems affected by an impairment

a. The test results shall be recorded on the impairment control tag.
b. Hydrostatic testing shall be witnessed if requested by the fire system maintenance personnel.

5.1.3.17 The EDO shall be notified that testing is completed.

5.1.3.18 The fire system maintenance personnel shall notify the emergency fire dispatcher that the repairs are completed and all systems are in service.

5.1.3.19 The EDO shall reset supervisory alarms and log all systems in service.

5.1.4 RESPONSIBILITIES

5.1.4.1 COD shall

a. Comply with requirements delineated in this section when impairing a fire protection system and those applicable requirements contained in NFPA Codes.
b. Ensure that impairments are restored in a timely manner.
c. Monitor the restoration process until the fire protection system is fully operational.
d. Identify to the Facility Coordinator and/or Facility Safety Head actions required to minimize the damage from fire during outages.

5.1.4.2 LaRC AHJ shall perform tasks as delineated in this section.

5.1.4.3 EDO shall perform tasks as delineated in this section.

5.2 UTILITY IMPAIRMENTS AFFECTING FIRE PROTECTION SYSTEMS

5.2.1 PURPOSE

5.2.1.1 This section establishes the requirements for planned and emergency utility outages that affect fire protection.

5.2.3 SCOPE

5.2.3.1 This standard shall apply to all personnel who may impair a utility system which affects fire protection at LaRC.

a. This standard shall not apply to impairments during the normal and usual preventive maintenance inspections and testing of utility systems as required by LaRC standards.
b. If a fire protection system is impaired as a result of a normal and usual preventive maintenance inspection or test, this impairment standard shall apply.

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5.2.4 REQUIREMENTS

5.2.4.1 The COD shall notify the Emergency Dispatch Office (EDO) 24 hours in advance of all planned utility outages.

a. Immediate notification shall be made to the LaRC AHJ in the event of an emergency outage:
   (1) The emergency fire dispatcher shall notify the LaRC AHJ and fire system maintenance personnel.
   (2) Utility outages in excess of 24 hours shall require the implementation of Section 5.1 of this document.

5.2.4.2 The LaRC AHJ shall determine if fire protection systems will be affected by the utility outage.

a. If fire protection is affected, the LaRC AHJ shall follow the requirements of Section 5.1.

5.2.4.3 The LaRC AHJ shall ensure that the affected fire protection system is logged out-of-service.

5.2.4.4 If additional protection is required, temporary feed lines (such as temporary piping, hose lines, or electrical service) shall be installed.

5.2.4.5 COD shall notify the emergency fire dispatcher when the utility system is placed back in regular service.

5.2.5 RESPONSIBILITIES

5.2.5.1 COD shall:

a. Comply with requirements delineated in this section when impairing a utility system which affects fire protection aspects.
b. Ensure that utility impairments are restored in a timely manner.

5.2.5.2 LaRC AHJ shall:

a. Perform tasks as delineated in this standard.
b. Identify to the Facility Coordinator and/or Facility Safety Head actions required to minimize the damage from fire during outages.

5.2.5.3 Facility Coordinator and/or Facility Safety Head shall implement the necessary interim compensatory measures as required by the LaRC AHJ.

5.2.5.4 EDO shall complete the tasks delineated in this section.

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5.3 FIRE PROTECTION SYSTEM WINTERIZATION

5.3.1 PURPOSE

5.3.1.1 This section establishes the requirements for developing a winterization plan to ensure that fire protection systems are protected against cold weather conditions.

5.3.2 SCOPE

5.3.2.1 This standard shall apply to all water-based fire protection systems at LaRC.

5.3.3 REQUIREMENTS

5.3.3.1 Annual Inspections

5.3.3.2 The fire system maintenance personnel shall inspect each system which requires winterizations during the fall to ensure that all areas are winterized to protect the installed fire protection systems.

5.3.3.3 This annual inspection shall include the following items (as a minimum):

a. Condition/operation and adequacy of heating systems (e.g., forced air, radiant heaters, and portable heaters).
b. Condition/operation of thermostats and filters.
c. Condition/operation/installation of heat tape systems.
d. Draining of sprinkler system drip lines, fire pump hose headers, dry pipe sprinkler system air compressors, and dry system drum drip auxiliary drains.

5.3.3.4 Any deficiencies identified shall be documented. Corrective action to repair or resolve the deficient condition shall be initiated immediately.

5.3.3.5 Winterization inspection records shall be maintained.

5.3.3.6 All areas where fire systems are installed shall be provided with sufficient heat and/or noncombustible insulation to prevent freezing and/or equipment damage.

5.3.3.7 Temporary freeze protection measures (such as portable heaters) shall not be used as a permanent means of freeze protection for fire protection systems. Permanent protection (such as forced hot air, fixed radiant heaters, insulation) shall be provided.

5.3.3.8 Heat tape and portable heaters may be used to winterize existing fire protection systems only if and when engineered protection measures are not readily available or feasible. If such measures shall be used, the following restrictions shall be observed.

a. Portable heaters used for temporary fire protection system freeze protection shall comply with Section 7.5 of this document.

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b. If heat tape is to be used as the primary heat source to prevent existing fire suppression system piping from freezing, the following conditions shall be met:
   (1) The heat tape used shall be Underwriters Laboratories Inc. (UL) listed for its intended use (e.g., specifically tested for the use on metal pipe with insulation).
   (2) The heat tape shall be self-regulating.
   (3) Noncombustible insulation shall be used over the pipe and heat tape.
   (4) The fire system pipe temperature shall be monitored by a system that includes a mechanism to transmit a trouble alarm to the communication center if the pipe temperature drops below 45°F.
   (5) Heat tape shall not be used for new system designs. An exception to this rule is that heat tape in compliance with the other requirements of this standard may be used to prevent fire system risers in unheated trailer crawl spaces from freezing.
   (6) All heat tape installations shall be approved by the LaRC AHJ.

5.4 NONEMERGENCY USE OF FIRE HYDRANTS

5.4.1 PURPOSE

5.4.1.1 This section provides the requirements and responsibilities for the nonemergency use of fire hydrants.

5.4.2 SCOPE

5.4.2.1 This standard shall apply to NASA facilities, operations and activities where water is being drawn from a LaRC fire hydrant.

Note: This standard shall not apply to fire hydrant/water supply testing.

5.4.3 REQUIREMENTS

5.4.3.1 Requests for the nonemergency use of fire hydrants shall be made to the LaRC Fire Chief prior to use. 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.
d. Duty officer notified.

5.4.3.2 Requests for nonemergency use of fire hydrants shall be approved by the LaRC Fire Chief with the following restrictions:
a. The 4-inch port shall be reserved for LaRC Fire Department use only.
b. One or both of the 2 1/2 -inch fire hydrant ports may be reserved for nonemergency use. The hydrant user shall provide an approved 2 1/2-inch gate valve on one or both of the 2 1/2-inch fire hydrant ports, reduced down to
1 1/2 inches.

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c. The hydrant user shall provide the estimated duration of impairment and the amount of water to be used
d. Other sections or systems are not already out of service.
e. The requested use does not affect overall Center operation.

5.5 INSPECTION, TESTING, AND MAINTENANCE DOCUMENTATION REVIEW AND ANALYSIS

5.5.1 PURPOSE

5.5.1.1 This section establishes a system for controlling fire protection inspection, testing, and maintenance documentation to ensure review for determining the expected remaining life for fire protection equipment and, when necessary, for extending that life.

5.5.1.2 A life extension program shall provide the technical rationale for allowing aging fire protection equipment, particularly equipment beyond its nominal life expectancy, to continue to operate.

5.5.2 SCOPE

5.5.2.1 This section shall apply to all fire protection inspection, testing, and maintenance activities at LaRC.

5.5.3 REQUIREMENTS

5.5.3.1 General

5.5.3.2 Documentation shall be generated for all inspection, testing, and maintenance activities for fire systems such as fire alarm and sprinkler systems.

5.5.3.3 Maintenance inspections shall be designed to determine whether or not the equipment being inspected will operate safely until the next scheduled inspection.

5.5.3.4 Each inspection, testing, and maintenance activity may be designed to add confidence to a calculated estimated remaining life.

5.5.3.5 Inspection, testing, and maintenance documentation shall be reviewed for evidence of equipment aging and wear.

5.5.3.6 The nominal life expectancy of equipment shall be established using accepted industry practices and experience, based on design specification. The design life may or may not equal the nominal life expectancy.

5.5.3.7 The expected remaining life for each piece of equipment or system may be estimated based on the review of the inspection, testing, and maintenance documentation. The expected

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remaining life shall be represented as a range of values or a period of time after which the probability of failure becomes unacceptably high.

5.5.3.8 Inspection, testing, and maintenance records (including plans, checklists, notes, reports, and other records associated with the establishment, completion and verification of corrective actions for fire protection issues) shall be permanent records, retained for the life of the system, maintained by the appropriate section or department.

5.5.4 RESPONSIBILITIES

5.5.4.1 LaRC AHJ shall:

a. Establish a facility fire protection equipment inspection program which produces useful documentation.
b. Maintain and review the fire protection equipment inspection, testing, and maintenance documentation to determine life expectancy.
c. Establish the nominal life expectancy for fire protection equipment.

5.6 INSPECTION, TESTING, AND, MAINTENANCE MATRIX

5.6.1 PURPOSE

5.6.1.1 This section establishes the inspection, testing, and maintenance frequencies for equipment and systems used at LaRC.

5.6.2 SCOPE

5.6.2.1 This section shall apply to all fire protection equipment and systems at LaRC.

5.6.3 REQUIREMENTS

5.6.3.1 General

5.6.3.1.1 All water-based fire protection equipment and systems shall be inspected at the frequencies indicated in National Fire Protection Association (NFPA) 25, except for specified deviations approved by the LaRC AHJ.

5.6.3.1.2 When supported by historical documentation, technology, or sound fire protection engineering judgment, the NFPA inspection, testing, and maintenance frequency may be modified by the LaRC AHJ.

5.6.3.2 Fire Barriers and Walls

5.6.3.2.1 Floor-ceiling assemblies and bearing and nonbearing wall or partition assemblies used as fire barriers to form fire compartments shall be designed and construction tested to meet the conditions of acceptance in NFPA 251.

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5.6.3.2.2 Once accepted, the fire barrier shall not require further attention unless it is modified.

5.6.3.3 Fire Doors and Dampers.

5.6.3.3.1 Fire door and damper assemblies shall be designed and constructed to meet the requirements of NFPA 80.

5.6.3.3.2 Fire door and dampers shall be inspected, tested and maintained in accordance with Table 5.1.

Table 5.1, Inspecting, Testing, and Maintaining: Fire Doors and Dampers.

Component	Activity	LaRC Frequency	Component	Activity	LaRC Frequency
Door	Inspection	Annually	Auto closing doors	Test	Annually
Closer	Inspection	Annually	Sliding/Rolling doors	Test	Annually
Latch	Inspection	Annually	Doors	Maintenance	As needed
Hinges	Inspection	Annually	Fire dampers	Inspection	Annually
Coordinator	Inspection	Annually	Fire dampers	Test	Annually
Chains and cables	Inspection	Annually	Fire dampers	Maintenance	Annually

5.6.3.4 Valves and Fire Department Connections

5.6.3.4.1 Valves and fire department connections shall be designed and installed to meet the requirements of NFPA 13.

5.6.3.4.2 Valves and fire department connections shall be inspected, tested and maintained in accordance with Table 5.2.

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Table 5.2, Inspecting, Testing, and Maintaining: Valves and Fire Department Connections.

Component	Activity	LaRC Frequency	Component	Activity	LaRC Frequency
Control Valve			**Preaction/Deluge Valve**		
Sealed	Inspection	Monthly	Priming water	Test	Quarterly
Locked	Inspection	Monthly	Low air pressure alarms	Test	Quarterly
Tamper switch	Inspection	Monthly	Full flow	Test	Quarterly
Alarm Valve			**Control Valve**		
Exterior	Inspection	Monthly	Position	Test	Quarterly
Interior	Inspection	5 years	Operation	Test	Annually
Strainers, filters, orifices	Inspection	5 years	Supervisory	Test	Quarterly
Check Valve			**Water Flow Alarm**	Test	Quarterly
Interior	Inspection	5 years			
Preaction/Deluge Valve			**Dry Pipe Valves/Quick-Opening Devices**		
Enclosure (during cold weather)	Inspection	Monthly	Priming water		
Exterior			Low air pressure alarm	Test	Annually
Interior	Inspection	Monthly	Quick-opening devices	Test	Quarterly
Strainers, filters, orifices	Inspection	Annually	Trip test	Test	Quarterly
	Inspection	Annually	Full flow trip test	Test	Annually
				Test	3 years
Dry Pipe Valves/Quick-Opening Devices			**Pressure Regulating and Relief Valves**		
Enclosure			Sprinkler system	Test	Annually
Enclosure (during cold weather)	Inspection	Monthly	Circulation relief	Test	Annually
			Pressure relief valve	Test	Annually
Exterior	Inspection	Monthly	Hose connection	Test	Annually
Interior	Inspection	Monthly	Hose rack	Test	5 years
Strainers, filters, orifices	Inspection	Annually			
Pressure Regulating and Relief Valves			**Backflow Prevention Assemblies**		
Sprinkler systems	Inspection	Monthly	Reduced pressure	Inspection	Monthly
Hose connection	Inspection	Annually	Reduced pressure detector	Inspection	Monthly
Hose rack	Inspection	Annually			
Fire pump:					
Casing relief valve	Inspection	Annually			
Pressure relief valve	Inspection	Annually			
Backflow Prevention Assemblies	Test	Annually	**Control Valve**	Maintenance	Annually
Fire Department Connections	Inspection	Monthly	**Preaction/Deluge Valve**	Maintenance	Annually
Main Drain	Test	Quarterly	**Dry Pipe Valve/Quick-Opening Device**	Maintenance	Annually

5.6.3.5 Deluge/Water Spray Systems

5.6.3.5.1 Deluge/water spray systems shall be designed and installed to meet the requirements of NFPA 15 and/or NFPA 16.

5.6.3.5.2 Deluge and water spray systems shall be inspected, tested and maintained in accordance with Table 5.3.

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Table 5.3, Inspecting, Testing, and Maintaining: Deluge/Water Spray Fixed Systems.

Component	Activity	LaRC Frequency
Check valves (interior)	Inspection	Monthly
Control valves (sealed)	Inspection	Monthly
Control valves (locked, supervised)	Inspection	Monthly
Deluge valve (exterior)	Inspection	Monthly
Detection systems	Inspection	Monthly
Drainage	Inspection	Quarterly
Fittings	Inspection	Monthly
Fittings (rubber-gasketed)	Inspection	Monthly
Hangars	Inspection	Monthly
Nozzles	Inspection	Monthly
Pipe	Inspection	Monthly
Strainers	Inspection	Annually
Supports	Inspection	Annually
Water supply piping	Inspection	Monthly
Heat (deluge valve house)	Inspection	Daily/weekly
Control valves	Operational test	Quarterly
Deluge valve	Operational test	Quarterly
Detection systems	Operational test	Annually
Flushing	Operational test	Quarterly
Main drain test	Operational test	Quarterly
Manual release	Operational test	Annually
Nozzles	Operational test	Annually
Strainers	Operational test	Annually
Water flow alarm	Operational test	Weekly
Water spray system test	Operational test	Quarterly
Deluge valve	Maintenance	Annually
Detection systems	Maintenance	Annually
Strainers	Maintenance	Annually
Strainers (baskets/screen)	Maintenance	5 years
Water spray system	Maintenance	Annually

5.6.3.6 Carbon Dioxide Suppression Systems

5.6.3.6.1 Carbon dioxide suppression systems shall be designed and installed to meet the requirements of NFPA 12.

5.6.3.6.2 Carbon dioxide suppression systems shall be inspected, tested and maintained in accordance with Table 5.4.

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Table 5.4, Inspecting, Testing, and Maintaining: Carbon Dioxide Suppression Systems.

Component	Activity	LaRC Frequency
Nozzles	Inspection	Annually
Enclosure doors	Inspection	Annually
Protected hazards	Inspection	Annually
Liquid level	Inspection	Annually
Cylinders (leakage)	Inspection	Annually
Flexible hoses and connections	Inspection	Annually
High-pressure cylinders weighed	Test	Annually
High-pressure control valves	Test	Annually
System actuation	Test	Annually
Full system discharge	Test	12 years
System components	Maintenance	As needed
Hose hydrostatic test	Maintenance	5 years
Cylinder hydrostatic test	Maintenance	12 years

5.6.3.6.3 Other Clean Agent Fire Suppression systems such as FM-200 shall be maintained in accordance with the appropriate NFPA code section and the manufactures written IT&M requirements.

5.7 HALON EXTINGUISHING AGENT

5.7.1 PURPOSE

5.7.1.1 This section provides the criteria for reducing and eliminating chlorofluorocarbon (CFC)-based Halon fire extinguishing agents at LaRC.

5.7.2 SCOPE

5.7.2.1 This section shall apply to all Halon extinguishing agents at LaRC.

5.7.3 REQUIREMENTS

5.7.3.1 General

5.7.3.1.1 No new Halon fire suppression agent shall be proposed to mitigate fire and life safety hazards:

a. Alternative protection in the form of automatic sprinkler suppression, water-mist, alternative gaseous agent, carbon dioxide, and preaction type suppression systems coupled with fire detectors shall be considered.

b. Automatic sprinklers shall be the preferred alternative, although facility specific design considerations may warrant the use of other protection.

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5.7.3.1.2 Halon extinguishing agents that have been budgeted but for which no outside contract exists for procurement shall be canceled.

5.7.3.1.3 Where an outside contract exists but procurement may be under way or on an as-needed basis, the contract should be modified to require alternative protection as described in 3.1.1.

5.7.3.1.4 Situations beyond NASA control shall require that some or all of the existing Halon systems in inventory be deactivated and portable extinguishers removed.

5.7.3.2 Portable Fire Extinguishers

a. Halon portable fire extinguishers shall not be purchased.
b. Existing Halon fire extinguishers shall be inspected and maintained pending the next hydrostatic testing interval.
c. Extinguishers requiring hydrostatic testing shall be removed from service and replaced with alternative portable extinguishers.
d. Halon agent (1211 or 1301) contained within extinguishers removed from service shall be retained as a reserve in an approved manner to be available for replenishment of Halon systems.

5.7.3.2.1 Portable fire extinguishers shall be installed to meet the requirements of NFPA 10.
5.7.3.2.2 Portable fire extinguishers shall be inspected, tested and maintained in accordance with Table 5.5.

Table 5.5, Inspecting, Testing, and Maintaining: Portable Fire Extinguishers.

Extinguisher Type	Visual Inspection	Hydrostatic Test Interval	Maintenance
Stored pressure	Monthly	5 years	Annually
Wetting agent	Monthly	5 years	Annually
Foam/ AFFF	Monthly	5 years	Annually
Dry chemical (SS)	Monthly	5 years	Annually*
Carbon dioxide	Monthly	12 years	Annually
Dry chemical (stored pressure; AS, BB, MS, SS) ABC	Monthly	12 years	Annually*
Dry chemical (cartridge operated, MS)	Monthly	12 years	Annually
Halon 1301	Monthly	12 years	Annually
Halon 1211 (MS)	Monthly	12 years	Annually

AS Aluminum Shell; BB - Brazed Brass Shell; MS - Mild Steel Shell; SS - Stainless Steel Shell
* Internal examination is not required at annual maintenance for stored pressure dry chemical fire extinguishers.

5.7.3.3 Specialty Halon Extinguishing Systems (Aircraft)

a. Existing Halon systems in Aircraft shall be inspected and maintained.

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b. Existing Halon systems shall be prioritized in order of importance to safety so that if one discharges and no more Halon is available to replenish it, the capability exists to deactivate other system(s) that are of lesser priority.
c. A contingency plan shall be developed for interim compensatory measures to be implemented if a Halon system is rendered inoperative and cannot be restored.
d. Planning for projects to replace Halon systems for aircraft with an alternative means of protection shall be expedited.

5.7.4 RESPONSIBILITIES

5.7.4.1 SFAB Head shall ensure CFC-based Halon fire extinguishing agents are eliminated or replaced in a timely manner.

5.7.4.1.1 Facility Coordinator and/or Facility Safety Head shall:
a. Assist the LaRC AHJ in determining the need for CFC-based Halon fire extinguishing agents within the facilities of equipment.
b. Ensure elimination or replacement of CFC-based Halon fire extinguishing agents as directed by the LaRC AHJ.

5.7.4.1.2 Fire Extinguisher maintenance personnel shall inspect and maintains Halon portable fire extinguishers as directed in this section.

5.7.4.1.3 LaRC AHJ shall:
a. Assess the need for CFC-based Halon fire extinguishing agents at LaRC.
b. Establish the priority for the elimination and/or replacement of CFC-based Halon fire extinguishing agents at LaRC.

5.7.5 RESPONSIBILITIES

5.7.5.1 Facility Coordinator and/or Facility Safety Head shall ensure timely resolution of all findings as a result of a FPE survey.

5.7.5.2 LaRC AHJ shall ensure that FPE surveys are conducted according to the annual schedule and perform tasks as delineated in this section.

5.7.5.3 LaRC AHJ shall assign Risk Rack code to survey findings and correct such findings as funding is made available. Mitigation for Rack III and above shall be performed.

5.7.5.4 Fire Pumps

5.7.5.4.1 Fire pumps shall be designed and installed to meet the requirements of NFPA 20.

5.7.5.4.2 Fire pumps shall be inspected, tested and maintained in accordance with Table 5.6.

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Table 5.6, Inspecting, Testing, and Maintaining: Fire Pumps

Component	Activity	LaRC Frequency
Pump house, heating	Inspection	Weekly
Pump house, ventilating louvers	Inspection	Weekly
Fire pump system	Inspection	Weekly
Pump operation, no-flow condition	Test	Weekly
Pump operation, flow condition	Test	Annually
Hydraulic	Maintenance	Annually
Mechanical transmission	Maintenance	Annually
Electrical system	Maintenance	As needed
Controller, various components	Maintenance	As needed
Motor	Maintenance	Annually
Diesel engine system, various components	Maintenance	As needed

5.7.5.5 Fire Water Systems and Fire Hydrants

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

5.7.5.5.2 Fire water systems and fire hydrants shall be inspected, tested and maintained in accordance with Table 5.7. Or as AHJ requires to be given in writing.

Table 5.7, Inspecting, Testing, and Maintaining: Private Fire Service Mains.

Component	Activity	LaRC Frequency
Hydrants (dry barrel and wall)	Inspection	Annually and after each operation
Monitor nozzles	Inspection	Semiannually
Mainline strainers	Inspection	Annually and after each significant flow
Piping (exposed)	Inspection	Annually
Monitor nozzles	Test	Flow annually
Hydrants	Test	Semiannually
Piping (exposed and underground)	Gradient flow test	5 years
Mainline strainers	Maintenance	Annually and after each operation
Hydrants	Maintenance	Annually
Monitor nozzles	Maintenance	Annually

5.7.5.6 Standpipe Systems

5.7.5.6.1 Standpipe systems shall be designed and installed to meet the requirements of NFPA 14.

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5.7.5.6.2 Standpipe systems shall be inspected, tested and maintained in accordance with Table 5.8.

Table 5.8, Inspecting, Testing, and Maintaining: Standpipe and Hose Systems.

Component	Activity	LaRC Frequency
Control valves	Inspection	Weekly/Monthly
Pressure regulating devices	Inspection	Quarterly
Piping	Inspection	Quarterly
Hose connections	Inspection	Annually
Cabinet	Inspection	Annually
Hose	Inspection	Removing hose
Hose storage device	Inspection	Annually
Alarm device	Test	Quarterly
Hose nozzle	Test	Annually
Hose storage device	Test	Annually
Hose	Test	Removing hose
Pressure control valve	Test	5 years
Pressure reducing valve	Test	5 years
Hydrostatic test	Test	5 years
Flow test	Test	5 years
Hose connections	Maintenance	Annually
Valves (all types)	Maintenance	Annually

5.7.5.6.3 Facility Emergency Lights

5.7.5.6.3.1 Facility emergency lights shall be designed and installed to meet the requirements of NFPA 101.
5.7.5.6.3.2 Facility emergency lights shall be inspected, tested and maintained in accordance with Table 5.9 and Section 6.3 of this LPR or as required by the AHJ.

5.7.5.6.3.3 Emergency lights that have the auditable alarm units that provide the code required test does not require to have the functional test. Monthly visual test still required.

Table 5.9, Inspecting, Testing, and Maintaining: Facility Emergency Lights.

Component	Activity	LaRC Frequency
Battery operated unit	Inspection	Biannually
Battery operated unit	30-second test	Biannually
Battery operated unit	1.5-hour test	Not performed

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5.7.5.6.4 Water Storage Tanks

5.7.5.6.4.1 Water storage tanks are designed and installed to meet the requirements of NFPA 22.

5.7.5.6.4.2 Water storage tanks are inspected, tested and maintained in accordance with Table 5.10.

Table 5.10, Inspecting, Testing, and Maintaining: Water Storage Tanks.

Component	Activity	LaRC Frequency
Condition of water in tank	Inspection	Annually
Water temperature	Inspection	Daily/Weekly*
Heating system	Inspection	Daily/Weekly
Control valves	Inspection	Daily/Weekly
Water level	Inspection	Weekly/Monthly
Tank exterior	Inspection	Quarterly
Support structure	Inspection	Quarterly
Catwalks and ladders	Inspection	Quarterly
Surrounding area	Inspection	Quarterly
Hoops and grille	Inspection	Annually
Painted/coated surfaces	Inspection	Annually
Expansion joints	Inspection	Annually
Interior	Inspection	5 years/3 years
Check valves	Inspection	5 years
Temperature alarms	Test	Monthly
High-temp. limit switches	Test	Monthly
Water level alarms	Test	Semiannually
Level indicators	Test	5 years
Pressure gauges	Test	5 years
Water level	Maintenance	As needed
Drain sediment	Maintenance	Semiannually
Thermostats	Maintenance	As Needed
Cathodic protection	Maintenance	Annually
Drain valves cycled	Maintenance	Annually
Vent screen	Maintenance	Annually
Control valves	Maintenance	Annually
Repainting—steel	Maintenance	As needed
Embankment-supported rubberized fabric (ESRF)	Maintenance	As needed
Check valves	Maintenance	As needed

* Cold weather/heating season only.

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5.7.5.6.5 Fire Alarm and Detection Systems

5.7.5.6.5.1 Fire alarm and detection systems shall be designed and installed to meet the requirements of NFPA 72.

5.7.5.6.5.2 Fire alarm and detection systems shall be inspected, tested and maintained in accordance with Table 5.11.

Table 5.11, Inspecting, Testing, and Maintaining: Fire Alarm and Detection Systems.

Component	Activity	LaRC Frequency
Alarm Appliances		
Audible devices	Inspection	Annually
Speakers	Inspection	Annually
Visible devices	Inspection	Annually
Batteries	Inspection	Monthly
Charger test (replace battery as needed)	Test	Annually
Discharge test (30 minutes)	Test	Annually
Load voltage test	Test	Annually
Specific gravity	Test	Annually
Control Equipment		
Functions	Test	Annually
Fuses	Inspection/Test	Annually/Annually
Interfaced equipment	Inspection/Test	Annually/Annually
Lamps and LEDs	Inspection/Test	Annually/Annually
Primary (main) power supply	Inspection/Test	Annually/Annually
Transponders	Test	Annually
Control Panel Trouble Signals	Inspection/Test	Annually
Voice Communications Equipment	Inspection/Test	Annually
Fiber-Optic Cable Connections	Inspection/Test	Annually/Annually
Guard's Tour Equipment	Inspection/Test	Annually
Initiating Devices		
Air sampling	Inspection	Annually
Duct detectors	Inspection/Test	Annually
Electromechanical Releasing device	Inspection/Test	Annually
Extinguishing system switches	Inspection/Test	Annually
Fire alarm boxes	Inspection/Test	Annually
Heat detectors	Inspection/Test	Annually
Radiant energy fire Detectors	Inspection/Test	Annually
Smoke detectors	Inspection	Annually
Functional	Test	Annually
Sensitivity (see 7-3.2.1.)	Test	Annually
Supervisory signal devices	Inspection/Test	Annually
Water flow devices	Inspection/Test	Quarterly
Fuel-gas and other detectors	Test	Semiannually
Special Procedures	Inspection/Test	Annually
Transient Suppressers	Inspection	Annually

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5.7.6 RESPONSIBILITIES

5.7.6.1 The LaRC AHJ is responsible for ensuring that inspection, testing, and maintenance operations are conducted as noted in this section.

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CHAPTER 6

6. LIFE SAFETY

6.1 MEANS OF EGRESS

6.1.1 PURPOSE

6.1.1.1 This section delineates the processes and requirements for maintaining the means of egress in LaRC facilities.

6.1.2 SCOPE

6.1.2.1 This section shall apply to all normally occupied LaRC facilities, structures, facilities, and operations.

6.1.3 REQUIREMENTS

6.1.3.1 Design and Construction of Means of Egress

6.1.3.1.1 COD shall:

a. Ensure that all new facility designs or modifications under their jurisdiction incorporate the requirements of NFPA 101, Code for the Safety to Life from Fire in Buildings and Structures (a.k.a., Life Safety Code).
b. Ensure that all new facility designs or modifications under its jurisdiction incorporate the requirements of Section 4.1 of this document.
c. Submit all facility designs and modifications to the LaRC AHJ for review and approval.

6.1.3.1.2 The LaRC AHJ shall review and approve all new designs and modifications to ensure that life safety is adequate to meet the specified criteria.

6.1.3.2 Maintaining Life Safety in Facilities

6.1.3.2.1 Facility Coordinator and/or Facility Safety Head shall:

a. Ensure that all facility exits and means of egress are maintained clear and unobstructed.
b. Ensure that material is not stored in stairwells or corridors of facilities.
c. Ensure that operations barriers such as roped areas do not affect exit routes.
d. Ensure that life safety features take precedence over security or operations features.
e. Ensure that no furnishings, decorations, or other objects obstruct the means of egress.
f. Ensure that exit doors are maintained in good operating condition:
    (1) Doors in the means of egress shall not be locked to prevent unobstructed exiting, unless specific approval is obtained from the LaRC AHJ.
    (2) Doors in the means of egress shall not require more than one action to open, unless specific approval is obtained from the LaRC AHJ Fire doors shall not be blocked open.

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(3) All hardware is function properly so that door will easily close and latch after use

g. Ensure that automatic sprinkler systems, fire detection and alarm systems, exit lighting, fire doors, and other fire protection features required by the Life Safety Code are continuously maintained in operating condition or that interim compensatory measures are implemented.

h. Ensure that interior finishes are maintained noncombustible or flame resistant.

i. Ensure that freestanding partitions and space dividers are manufactured of limited combustible materials and those fabric coverings are flame resistant.

6.1.3.2.2 The LaRC AHJ shall ensure performance of routine fire protection facility assessments to evaluate life safety components and shall ensure that an acceptable degree of life safety is provided.

6.1.3.2.3 The Fire Department station officer shall perform housekeeping inspections of facilities on a routine basis to ensure that means of egress are maintained free of storage and are unobstructed.

6.1.4 RESPONSIBILITIES

6.1.4.1 COD shall ensure that each facility is designed with the required life safety features.

6.1.4.2 Facility Coordinator and/or Facility Safety Head shall:

a. Ensures that an acceptable degree of life safety is provided by following the practices delineated in this section.

b. Contacts the LaRC AHJ before establishing a new use for a facility or structure or modifying existing facilities or structures.

6.1.4.3 LaRC AHJ shall evaluate the design and operation of facilities and structures to ensure that the requirements of this section are met.

6.1.4.4 LARC Fire Chief shall ensure that an acceptable degree of life safety is provided in facilities by performing periodic facility inspections and maintaining documentation of all inspections.

6.2 FACILITY EVACUATION PLANS

6.2.1 PURPOSE

6.2.1.1 This section delineates the guidelines for evacuation plans for personnel from LaRC facilities if the diagrams are installed.

6.2.3 SCOPE

6.2.3.1 This section shall apply to all normally occupied LaRC facilities, structures, facilities, and operations.

Verify the correct revision before use by checking the LMS Web site.

6.2.4 REQUIREMENTS/RESPONSIBILITIES

6.2.4.1 Facility Evacuation Diagrams

6.2.4.1.1 A facility evacuation diagram may be requested by a Facility Coordinator and/or Facility Safety Head. If one is requested and installed, it shall follow the requirements of this section.

6.2.4.1.2 Facility Coordinator and/or Facility Safety Head shall ensure that all evacuation routes are noted on a facility floor plan/diagram. To develop the evacuation diagrams, the following directions shall be used:

a. The facility floor diagram shall be as simple as possible. Note only walls, doors, room numbers, stairs, or other pertinent structural features that are essential to egress.
b. Use directional arrows to illustrate the evacuation path.
c. Note on the diagram an assembly point for evacuating personnel that is a safe distance away from the facility.
d. Do not note other features, such as fire extinguishers, pull stations, nonrequired egress paths, and safety showers, as they only complicate the diagrams.

6.2.4.1.3 The LaRC AHJ shall review and approve all facility evacuation diagrams to ensure a safe and orderly evacuation of personnel. A sample facility evacuation plan is shown in Figure 6.1.

6.2.4.2 Personnel Evacuation Directions

6.2.4.2.1 All staff shall respond to an evacuation alarm by leaving the affected and/or alarmed area without delay and reporting to the designated assembly point, avoiding any obviously unsafe route while on the way. Special facility/operation hazards may require personnel to shelter in place this action can only be approved by the LaRC AHJ and SFAB Head

6.2.4.2.2 Personal needing assistance to evacuate a facility because of known mobility issue weather temporary or permanent shall have a “buddy” assigned to them to aid in the emergency evacuation of a facility.

6.2.4.2.3 Personnel shall make a visual check along the evacuation route for persons unable to evacuate, guide and assist them if possible without delaying evacuation or jeopardizing one’s personal safety, and report such cases to the responding emergency personnel. Personnel shall perform only those necessary crash, panic, or scram shutdowns which can be done without delaying evacuation. Personnel shall stay at the designated assembly point until released by the emergency personnel.

6.2.5 RESPONSIBILITIES

6.2.5.1 LaRC AHJ shall evaluate the facility evacuation diagrams and the designated assembly points.

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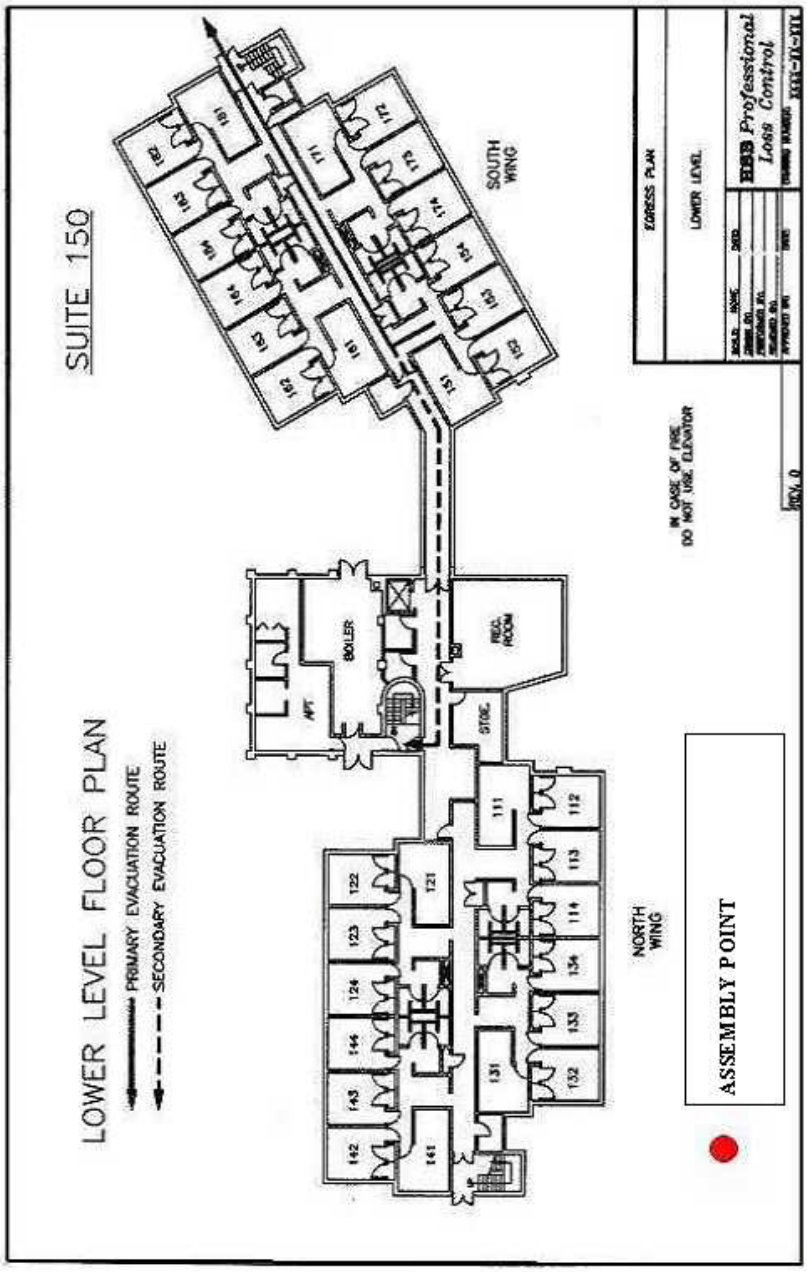
6.2.5.2 Figure 6.1, Sample Facility Evacuation Plan.



Verify the correct revision before use by checking the LMS Web site.

6.3 FACILITY EMERGENCY LIGHTS

6.3.1 PURPOSE

6.3.1.1 This section provides the requirements and responsibilities pertaining to battery powered emergency lighting systems.

6.3.2 SCOPE

6.3.2.1 These requirements shall apply to all LaRC-managed facilities, operations, and activities, including facilities leased by NASA (to the extent that leased facility owners shall be notified of emergency exit features in need of repair or maintenance).

6.3.3 REQUIREMENTS

6.3.3.1 Required Emergency Light Testing Program

6.3.3.1.1 Non Self Testing Emergency lights shall be operationally tested semiannually for a minimum of 30 seconds.

a. During this test, the lights shall be inspected to verify the following (every month):
   (1) Electrical cords shall not be damaged, frayed, or longer than 36 inches
   (2) Lamps shall not be cracked or damaged
   (3) Units shall be securely mounted
   (4) Lamps shall be properly positioned to provide illumination for the required area(s)
   (5) Lamps shall illuminate within 10 seconds of switching to the backup power supply

6.3.3.1.2 Non Self Testing All emergency lights shall be operationally tested annually. NFPA standards recommend a 1 1/2-hour operational test.

6.3.3.1.3 Self Testing Emergency Lights do not require to be operational tested.

6.3.3.1.4 Self Testing Emergency Lights does require a monthly vision inspection of the following;

a. Electrical cords shall not be damaged, frayed, or longer than 36 inches
b. Lamps shall not be cracked or damaged
c. Units shall be securely mounted
d. Red power LED light on

6.3.3.1.5 All emergency light tests shall be documented.

6.3.3.1.6 Emergency lights that are found deficient shall be repaired within 24 hours, or

a. portable emergency lights shall be provided at the affected area(s) until the permanent lights are restored to service. NASA LaRC is currently using self testing and alarming emergency lights.

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6.3.3.1.7 All new emergency lights shall conform to this standard or as required by AHJ.

6.3.4 RESPONSIBILITIES

6.3.4.1 COD shall be responsible for testing all the battery powered emergency lighting units within their facility.

6.3.4.2 COD shall be responsible for recording the annual testing in the Centers maintenance reporting system for Non self testing Emergency Lights

6.3.4.3 Facility Safety Heard and\or Facility Coordinator is responsible for the visual inspection of all emergency lights within their facilities as per this document.

6.4 OCCUPANCY PERMIT APPROVAL

6.4.1 PURPOSE

6.4.1.1 This section outlines the occupancy requirements that shall be completed and complied with before LaRC personnel can occupy any newly constructed or renovated facilities/structures, labs, or areas, or before any changes in an existing occupancy classification are made.

6.4.2 SCOPE

6.4.2.1 This section shall apply to all activities at LaRC and all off-site locations leased by NASA for routine occupancy by LaRC personnel.

6.4.3 REQUIREMENTS

6.4.3.1 General

6.4.3.1.1 A Certificate of Beneficial Occupancy shall cover the period of time following construction/modification of an area or facility when the area substantially complies with all fire protection and Life Safety Code requirements but is not in full literal compliance with all Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), NASA, and LaRC safety requirements.

6.4.3.1.2 A Certificate of Final Occupancy shall cover the period of time following completion of all aspects of literal compliance with the referenced codes and standards.

6.4.3.1.3 A copy of the certificate shall be kept by the facility.

a. The certificate shall be reviewed as part of the fire protection engineering survey process.

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6.4.3.1.4 No LaRC supervisor or employee shall attempt to occupy an area or facility or to operate any processes that has been added, changed, or modified prior to the issuance of a Certificate of Beneficial Occupancy or a Certificate of Final Occupancy.

6.4.3.1.5 Before a Certificate of Beneficial Occupancy shall be issued, the area or facility shall be inspected by the LaRC AHJ and SFAB Head (or designee) to verify that no imminent danger or serious OSHA violations exist as the facility is presently constructed.

6.4.3.1.6 Technical safety deficiencies resulting in the issuance of a Certificate of Beneficial Occupancy rather than a Certificate of Final Occupancy shall be corrected in an expeditious manner.

a. In no case shall the Certificate of Beneficial Occupancy be valid in excess of 45 days.

6.4.3.1.7 Whenever a hazard which would be classified as an imminent danger violation of the OSHA standards is identified, the Facility Coordinator and/or Facility Safety Head immediately shall take interim corrective actions (barricade, evacuate, and lock out).

a. Permanent corrective actions shall be completed within 24 hours.
b. Failure to complete corrective actions within 24 hours shall result in revocation of the Beneficial or Final Occupancy status.

6.4.3.1.8 Whenever a condition which would be classified as a serious violation of the OSHA standards is reported to or observed by the LaRC AHJ, the Facility Coordinator and/or Facility Safety Head shall immediately barricade the hazardous condition.

a. Permanent corrective actions shall be taken within 10 working days.
b. Noncompletion of corrective actions within 10 working days shall result in the revocation of the Certificate of Beneficial or Final Occupancy.

6.4.3.2 Items/Features Required Prior to Issuance of a Certificate of Beneficial Occupancy

a. Portable fire extinguishers shall be located as required by NFPA 10 (Portable Fire Extinguishers) and identified by conspicuous signs visible from all angles. The LaRC AHJ shall concur with the location and identification methods for the extinguishers.
b. Emergency lighting shall be required if the area or facility is to be occupied at night or if there are interior areas where windows do not provide minimum lighting (1 foot-candle at floor level) in the means of egress.
c. Employee emergency evacuation routes shall be identified by the Facility Coordinator and/or Facility Safety Head and approved by the LaRC AHJ. Diagrams of the emergency evacuation routes are displayed on the wall adjacent to each required exit.
    (1) These routes shall take into consideration interface with any ongoing construction activities.
d. A fully functional employee evacuation alarm system shall be operational prior to the issuance of a Certificate of Beneficial Occupancy.
e. No combustibles shall be stored in the means of egress.
    (1) This shall require removal of all packing materials for fixtures and furniture before personnel are assigned to work in the area or facility.

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f. Floor plans showing all dimensions of the permanent offices and temporary work spaces shall be approved by the LaRC AHJ prior to the issuance of a Certificate of Beneficial Occupancy.
g. No flammable/combustible liquid processing or any other high-hazard operations shall be performed, even if an area is designed to process such liquids or is classified as high hazard, while an area or building/ structure is being occupied under a Certificate of Beneficial Occupancy.

6.4.3.2.1 A Certificate of Final Occupancy shall be required prior to any processing of flammable or combustible liquids.
a. An interim flammable/combustible liquids handling plan shall be developed if such liquids are to be present as part of the construction necessary to achieve the Certificate of Final Occupancy.

6.4.3.2.2 Permanent/Temporary identification of all hazards required by OSHA and NFPA shall include temporary hazards related to unfinished construction.
a. This identification shall be provided by signs, painting/color coding of hazards, and barricading.
b. Hazard identification signs that will still exist once the Certificate of Final Occupancy is granted shall be installed before the issuance of a Certificate of Beneficial Occupancy.

6.4.3.2.3 Preplanned impairments of automatic sprinkler and/or fire alarm systems during the period of Certificate of Beneficial Occupancy are authorized, by the LaRC AHJ. All impairments of the fire protection system(s) shall be conducted in accordance with Section 5.1 of this document.

6.4.3.2.4 Electrical installation and modifications which are part of new construction shall be verified to confirm their compliance with NFPA 70 (National Electrical Code) and NFPA 70E.

6.4.3.3 Items/Features Required Prior to Issuance of Certificate of Final Occupancy
a. Emergency evacuation alarms used on-site shall be connected to the sitewide supervised system.
b. Emergency evacuation alarms shall be audible in all public parts of the area requesting Final Occupancy.
c. Off-site locations shall have a plan approved by the LaRC AHJ.
d. Central station fire alarm monitoring of all fire alarm boxes at on-site locations shall be verified by the LaRC Fire Department inspector as part of the sitewide fire alarm.
e. Systems at off-site locations shall be connected to a central station alarm monitoring location and shall be tested to ensure functional operation.
    (1) This shall be accomplished in conjunction with the local authority having jurisdiction over the leased space location.
f. Permanently established and identified aisles shall be provided in non-office areas.
g. Permanently established and identified aisles shall be clearly apparent in office areas.
    (1) The aisles shall be free of any obstructions, including storage of transient materials.
h. Exit signs shall be in place.

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i. Emergency lighting shall be required if the area or building/structure is to be occupied at night or if it contains interior areas where windows do not provide minimum lighting (1 foot-candle at floor) in the means of egress.
j. Fire preplans shall be developed in accordance with Section 10.10
k. Unobstructed 36-inch access to utility rooms/electrical disconnects shall comply with NFPA 70 (National Electrical Code).
l. All areas in front of electrical disconnects and circuit breaker boxes shall be identified by markings on the floor or by appropriate signs notifying the occupants to keep the area clear at all times.
m. Permanent signs and postings shall be required by OSHA, NFPA, NASA, and LaRC performance requirements conform to the requirements of 29 CFR 1910.145 for the marking of hazards.
    (1) Temporary (handwritten or typewritten signs) or other nonstandard signs shall not be acceptable under a Certificate of Final Occupancy.

6.4.3.4 Requirements for On-Site Construction and Modifications

6.4.3.4.1 All facilities constructed or modified on-site shall be designed to meet an improved risk level of fire protection.

6.4.3.4.2 All off-site leased facilities shall fully comply with the local building and fire codes.

6.4.3.4.3 All off-site leased space shall be protected by an automatic sprinkler system equipped with a fire alarm monitoring system.
a. The fire alarm monitoring system shall automatically notify the local fire department.
b. The portion of the facility occupied by LaRC personnel shall fully comply with NFPA 101 (Life Safety Code).

6.4.3.5 Issuance of Certificate of Beneficial Occupancy

6.4.3.5.1 The LaRC AHJ and SFAB Head (or Designee) shall verify that all required items of this section are present and that no imminent danger or serious hazards exist in the area. Any item that is in technical noncompliance with OSHA, NFPA, NASA, or LaRC safety performance requirements is noted on the Certificate of Beneficial Occupancy.
a. Where appropriate, the noncompliance shall be identified by tags, barricades, or other interim corrective measures.
b. If no imminent danger exists the AHJ will issue a Certificate of Beneficial Occupancy.

6.4.3.5.2 The LaRC AHJ shall identify to the Facility Coordinator/Facility Safety Head/project engineer, all actions necessary prior to the issuance of Certificate of Final Occupancy.
a. The Certificate of Beneficial Occupancy shall not be issued until all interim corrective measures are physically in place and functional.

6.4.3.5.3 Issuance of Certificate of Final Occupancy

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6.4.3.5.4 To obtain a Certificate of Final Occupancy, the Facility Coordinator/Facility Safety Head/project manager shall notify the LaRC AHJ that all technical deficiencies identified by the inspection (that was part of the issuance of the Certificate of Beneficial Occupancy) have been corrected.

6.4.3.5.5 The LaRC AHJ and SFAB Head (or Designee) shall re-inspect the area to verify that all identified deficiencies during the Beneficial Occupancy inspection are corrected and that no new deficiencies have arisen in the area applying for Certification of Final Occupancy.

a. At this point a Certificate shall be issued by the AHJ.

6.4.4 RESPONSIBILITIES

6.4.4.1 COD shall:

a. Request the assistance of the LaRC AHJ in determining if proposed on-site or off-site space is suitable for proposed occupancy.
b. Submit drawings, sketches, etc., to the AHJ for approval prior to structural modifications by LaRC or subcontractor personnel.
c. Ensure that all new construction at LaRC is designed and constructed to the improved risk level of fire protection and that no known violations of OSHA, NFPA, NASA, or LaRC safety requirements are included as part of the final construction turnover packages.
d. Request the LaRC AHJ to issue a Certificate of Beneficial Occupancy and/or a Certificate of Final Occupancy.

6.4.4.2 Facility Coordinator and/or Facility Safety Head shall:

a. Request the assistance of the LaRC AHJ in determining if proposed changes in on-site use will affect the occupancy of an area or facility.
b. Initiate work orders, construction projects and purchase requisitions necessary to bring the area or facility into full compliance with all applicable standards.
c. Ensure that all proposed modifications meet an improved risk level of fire protection.
d. Submit design plans for temporary work space for approval.
e. Request the LaRC AHJ to issue a Certificate of Beneficial Occupancy and to issue a Certificate of Final Occupancy for all non-project on-site facility modifications.

6.4.4.3 LaRC AHJ shall:

a. Review all proposed structural modifications to existing areas or facilities/structures and construction proposal drawings/packages to verify that an on-site proposed usage qualifies as an improved risk level of fire protection.
b. Review drawings of off-site office areas and facilities/structures to ensure that they meet all local fire codes and that whatever portion is used by LaRC personnel fully complies with NFPA 101 (Life Safety Code).
c. Review all drawings for the installation of temporary workspace to ensure that the installation does not invalidate the Certificate of Final Occupancy.
d. Issue Certificates of Beneficial and Final Occupancy using LF 112, "Certificate of Occupancy."

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6.4.4.4 Fire Department Station Officer shall:

a. Perform specified fire inspections of all LaRC on-site and off-site locations to verify ongoing compliance with OSHA, NFPA, NASA, and LaRC safety requirements.

b. Inform and identify to the LaRC AHJ any condition that appears to be an imminent danger of fire protection concern.

c. Verify that no apparent changes in occupancy have occurred since the issuance of the Certificate of Final Occupancy.

Verify the correct revision before use by checking the LMS Web site.

CHAPTER 7

7. FIRE PROTECTION

7.1 SMOKING REGULATIONS

7.1.1 PURPOSE

7.1.1.1 This section reinforces the LaRC smoking policy and regulations.

7.1.2 SCOPE

7.1.2.1 This section shall apply to all facilities and areas that lie within the boundaries of LaRC.

7.1.3 REQUIREMENTS

7.1.3.1 Smoking shall be permitted only in designated smoking areas.

7.1.3.2 Adequate receptacles shall be provided in designated smoking areas.

7.1.3.3 Locations of fire extinguishers shall be at inside designated smoking areas.

7.1.3.4 Lighters, matches, or other flame-producing devices shall be used as intended.
a. Carrying/using “strike anywhere” matches shall be prohibited at LaRC.
b. Safety matches shall be permitted.

7.1.4 RESPONSIBILITIES

7.1.4.1 Office of Human Resources shall:
a. Be responsible for smoking policy at LaRC.
b. Coordinate requests for designated smoking areas with SFAB.

7.1.4.2 LaRC AHJ or Designee shall:
a. Determine if requested smoking areas are within a fire hazard area.
b. Ensure that all fire protection requirements of smoking areas are maintained.

7.2 FIRE LANES

7.2.1 PURPOSE

7.2.1.1 This section establishes general operating practices to ensure facility accessibility for fire fighting forces.

Verify the correct revision before use by checking the LMS Web site.

7.2.2 SCOPE

7.2.2.1 This section shall apply to all personnel and all facilities at LaRC.

7.2.3 REQUIREMENTS

7.2.3.1 General

7.2.3.1.1 Provisions for facility fire lane accessibility in new facilities or existing facility modifications or additions shall be considered in the design.

7.2.3.1.2 Facility entry/access points and response routes (fire lanes) shall be identified in the LaRC Fire Department prefire plan as required in Section 10.9 of this document.

a. The Facility Coordinator and/or Facility Safety Head shall notify the LaRC AHJ prior to facility configuration alteration to review and approve the potential fire lane impairments and to allow the LaRC Fire Department to update its pre-fire plan.

7.2.3.1.3 Access points and ingress/egress routes shall be maintained free of equipment, furniture, stored materials, and other items which impede interior access.

7.2.3.1.4 The arrangement of stored materials shall be such that all portions of the materials can be reached by fire fighting hose streams.

7.2.3.2 Fire Lanes

7.2.3.2.1 Fire lanes shall be provided to within 150 feet of all portions of a structure or outside storage area.

a. Where fire lanes are longer than 150 feet and terminate at a dead end, approved provisions for turning around fire department apparatus shall be provided. Figure 7.1 provides an illustration of the approved turnarounds.

7.2.3.2.2 Fire lanes shall not be less than 20 feet of unobstructed width.

7.2.3.2.3 Fire lanes shall be designed with an appropriate 25-foot inside turning radius and a 50-foot outside turning radius at turns to accommodate fire department apparatus.

7.2.3.2.4 Access roads shall be furnished by application of an all-weather driving surface of hot mix asphaltic concrete or concrete pavement over a flexible base capable of supporting loads imposed by LaRC Fire Department apparatus (not less than 80,000-pound live vehicle load). Access roads shall also have a minimum of 13 feet 6 inches of vertical clearance.

7.2.3.2.5 Fire lanes shall be marked with freestanding signs or marked curbs, sidewalks, or other traffic surfaces with the words “FIRE LANE – NO PARKING” painted in black letters on a yellow background.

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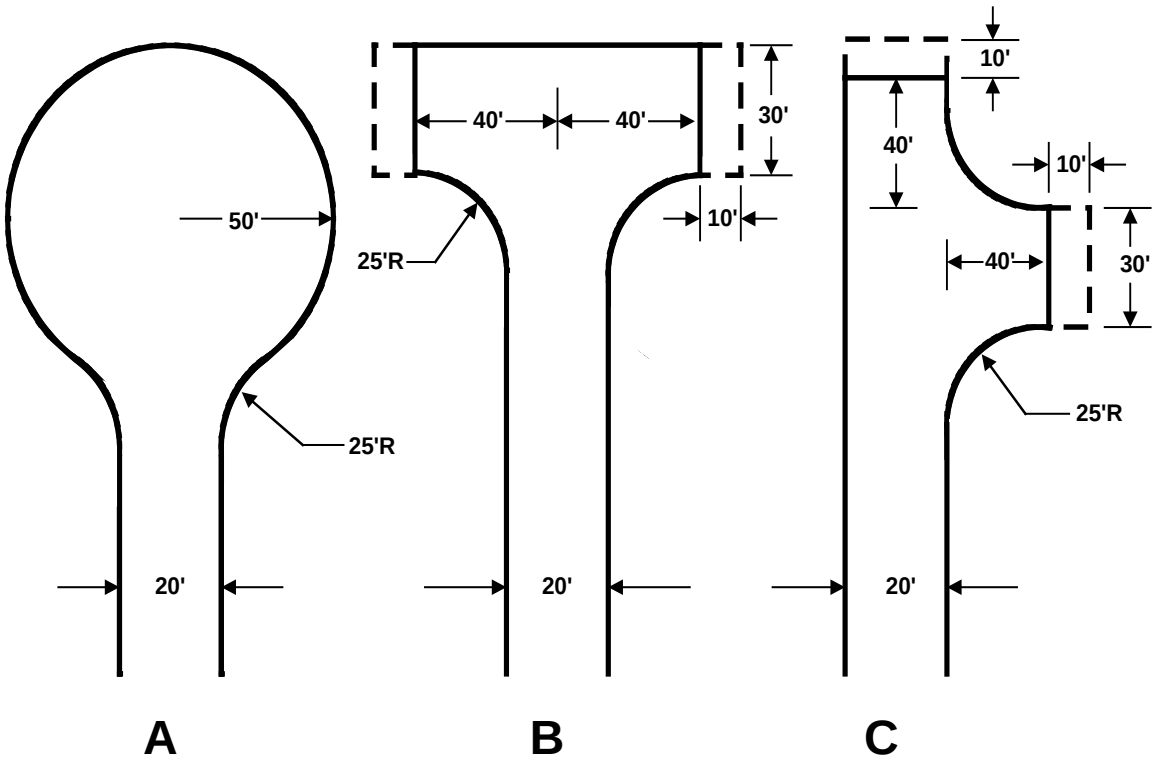
7.2.4 RESPONSIBILITIES

7.2.4.1 Fire Chief shall conduct facility walkthrough inspections, as part of the pre-fire planning, to identify facility access points.

7.2.4.1.1 Facility Coordinator and/or Facility Safety Head shall:

a. Ensure that access points and ingress/egress routes are not obstructed.
b. Ensure that proper configuration of stored items is maintained.
c. Notify LaRC AHJ of any facility configuration changes.



7.2.4.1.2 Figure 7.1, Approved Fire Lane Turnarounds.

7.2.4.1.3 The LaRC AHJ shall approve a cul-de-sac with a minimum 50-foot unobstructed radius and 30-foot by 80-foot “T” section of “Hammerhead” turn around, provided that an additional 10 feet of right of way around the 30-foot by 80-foot dimension can be provided with no obstructions over 1 foot high.

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7.3 HOT WORK/OPEN FLAME AND WELDING PERMIT SYSTEM

7.3.1 PURPOSE

7.3.1.1 This section establishes fire protection requirements for work or activities which require the use of flame-, heat-, smoke-, or spark-producing tools. These include, but are not limited to, acetylene and propane torches, electric arc welders, and activities such as grinding or brazing outside of designated shop facilities. The requirements for designated hot workshops are stipulated in Section 7.3.3.4 of this document.

7.3.2 SCOPE

7.3.2.1 This section shall apply to all organizations at LaRC, as well as to all contractors that operate at the facility.

7.3.2.2 Changes from this section for specialized operations shall be submitted to the LaRC AHJ for review and consideration in accordance with Section 2.3.

a. Only the LaRC AHJ shall grant a change to the “Hot Work” procedures.

7.3.3 REQUIREMENTS

7.3.3.1 General Precautions

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

a. Combustible walls or ceilings or those containing combustible insulation.
b. Tanks or pipes that have held flammable liquids (unless they have been thoroughly purged and tested for residual vapors).
c. Pipes or other metal in contact with combustible materials if ignition of material is possible due to conduction.
d. Metal partitions, walls, ceilings, or roofs having a combustible covering.
e. Walls or partitions of combustible sandwich-type panel construction.

7.3.3.1.2 The permit shall be posted in the area where the work is performed.

7.3.3.1.3 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.

7.3.3.1.4 Nearby personnel shall be protected from heat, sparks, and/or slag. This may be accomplished through the use of fire resistive screens or shields.

7.3.3.2 Hot Work Requirements

7.3.3.2.1 A NASA Langley Form 71, "Hot Work Permit," shall be completed and approved prior to the start of work.

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7.3.3.2.2 A flammable vapors test shall be conducted when flammable liquids, vapors, or gases may be present.

a. If test results exceed 25% of the lower explosive limit (LEL) for liquids and 0% LEL for gases, additional precautions shall be required.

7.3.3.2.3 Automatic sprinkler protection shall be in service where provided.

a. Hot work activities shall be specifically prohibited in areas that have automatic sprinkler protection which is out of service.

b. Additionally, welding or torch cutting on automatic sprinkler systems after installation shall be prohibited.

7.3.3.2.4 Portable fire extinguishers shall be available for fire watch use.

a. Facility fire extinguishers shall not be used to satisfy this requirement.

7.3.3.2.5 Flammable liquids within 35 feet of the hot work area shall be removed.

7.3.3.2.6 Oily deposits within 35 feet of the hot work area shall be cleaned/ removed.

7.3.3.2.7 Combustible materials within 35 feet of the hot work area shall be removed.

7.3.3.2.8 Combustible materials which cannot be removed shall be covered or shielded with flameproof covers, fire resistant guards, or fire resistant curtains.

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

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

7.3.3.2.11 Special precautions, as recommended by the LaRC AHJ, 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 as outlined in Section 5.1.

7.3.3.3 Fire Watch Requirements for Hot Work Activities

7.3.3.3.1 A fire watch shall be provided for all hot work operations performed outside of a dedicated “fixed” hot work shop location.

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

a. The extinguisher shall be in addition to the portable extinguishers located throughout the facility.

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7.3.3.3.3 The fire watch shall know where the nearest emergency pull station is and the telephone number to report an emergency.

7.3.3.3.4 The fire watch shall continuously monitor the work area for hazards.

7.3.3.3.5 The fire watch shall immediately notify the other worker(s) of the hazards.

7.3.3.3.5 The fire watch shall not have any other collateral duties.

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

7.3.3.3.7 The fire watch shall work with the fire Department and the EDO to ensure required smoke detectors are taken in and out of service as each day for the hot work area.

7.3.3.4 Shop Welding and Cutting Areas

7.3.3.4.1 Shops that perform hot work activities shall be located in noncombustible or fire resistant structures unless otherwise approved by the LaRC AHJ.

7.3.3.4.2 The area or shop shall be located in the sprinkler portion of the facility.

a. Hot work activities shall not be permitted while sprinkler protection is out of service, unless approved by the LaRC AHJ.

b. The LaRC AHJ shall notify the Facility Coordinator and/or Facility Safety Head of any impairments to the automatic sprinkler system within the shop area.

7.3.3.4.3 The area or shop boundary shall be constructed to prevent sparks and/or slag migration outside the approved area, or the immediate space surrounding the defined hot work area shall be kept clear of all combustibles or at least 35 feet in any direction in which sparks may travel.

(a) This 35-foot buffer shall not be considered part of the hot work area or shop.

7.3.3.4.4 Screens shall be provided to protect other workers from ultraviolet radiation hazards.

7.3.3.4.5 Unconnected gas cylinders stored in the areas or shops shall be limited to a 1-day supply.

7.3.3.4.6 Gas Cylinder requirement for gas welders and torches.

7.3.3.4.7 At no time shall oxygen-acetylene torches be brought into, or stored inside of LaRC facilities due to the severe fire hazard they pose.

a. Oxygen and acetylene cylinders shall be separated, capped, and properly stored outdoors in an approved gas storage area except as provided below:

(1) *Exception No.1: Oxy-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 correct pressure regulator.*

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(2) *Exception No. 2: Oxy-acetylene torches being used under a valid, active "hot work" permit at a non-fixed location may be left assembled if properly supported and fitted with correct pressure regulator.*

7.3.3.4.8 Fixed shop areas that perform hot work operations shall be issued a Hot Work Permit (a single permit can cover multiple operations) by the LaRC AHJ after review of the proposed area or shop for conformance to this standard.

a. Shop permits shall be written for a period not to exceed 1 year.

7.3.3.4.9 The shop or area supervisor shall request a new shop or area inspection whenever the configuration and/or occupancy of the fixed hot work area is changed.

7.3.3.4.10 A fire watch shall be required under specific circumstances in approved fixed hot work shops or areas at the discretion of the shop/area supervisor or the LaRC AHJ.

7.3.4 RESPONSIBILITIES

7.3.4.1 Facility Coordinator and/or Facility Safety Head shall:

a. Serve as the interface for special hazard situations and provides oversight and guidance to facility personnel performing hot work activities.
b. Ensure that all fixed hot work shop areas have permits posted as outlined in the standard.

7.3.4.2 LaRC Fire Chief or Designee shall:

a. Ensure that Hot Work Permits are issued in accordance with this standard.
b. Review special hazard situations and recommends practices and compensatory measures to prevent fires or explosions related to hot work activities.
c. Inspect fixed weld shop areas upon request from the shop supervisor or Facility Coordinator/Facility Safety Head and issues fixed weld shop permits.

7.3.4.3 Fire Watch shall ensure that the requirements of this section are followed.

7.3.4.4 Personnel Performing Hot Work shall:

a. Ensure that all aspects of the Hot Work Permit are in place and that the parameters of the permit are not breached.
b. Conduct hot work in accordance with the permit requirements.
c. Shop Welding Area Supervisor shall request a new Hot Work Permit prior to the expiration of the existing permit.

Verify the correct revision before use by checking the LMS Web site.

7.4 HEAT-PRODUCING APPLIANCES

7.4.1 PURPOSE

7.4.1.1 This section establishes the requirements for the use of portable heat-producing appliances.

7.4.2 SCOPE

7.4.2.1 This section shall apply to the use of portable heating appliances at LaRC.

7.4.3 REQUIREMENTS

7.4.3.1 General Requirements

7.4.3.1.1 Heat-producing devices shall not be used on or near combustible surfaces unless provided with adequate insulation. See manufacturer's recommendations for required separation distances.

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

a. They shall be disconnected from their power source or de-energized by an approved switch when tilted or tipped over.

7.4.3.1.3 When open-flame equipment is used, a special written permit shall be required for each use from the LaRC Fire Chief.

7.4.3.1.4 Coffee makers and similar appliances shall be UL Listed, installed so that they are in plain view.

a. They shall be separated and insulated from combustibles.
b. They shall be de-energized when not in use.

7.4.3.1.5 Combustible liquids used for refueling shall be stored in safety cans.

7.4.3.1.6 Heaters using gasoline (or other Class I Flammable and Class II Combustible liquids) shall be prohibited in any location (see National Fire Protection Association [NFPA] 30 for definitions).

7.4.3.1.7 The use of burner-type heaters shall only be permitted where and when approved by the AHJ.

Verify the correct revision before use by checking the LMS Web site.

7.4.3.2 Melting Kettles or Pots

a. An approved type of fire extinguisher shall be available at all locations where heating or melting kettles are used or hot substances are applied.
b. All heating or melting kettles or pots shall be mechanically stable.
c. Appropriate barriers shall be provided so the kettles/pots are isolated from pedestrian and vehicular traffic.
d. Kettles/pots shall not be used in combustible facilities
e. Kettles/pots shall not pose a fire risk to nearby structures.
f. Kettles/pots shall be covered and equipped with temperature indicating devices appropriate for the materials being heated.
g. Thinning with flammable solvents shall not be permitted.
h. Protective equipment and clothing shall be provided and used by all persons handling hot substances.

7.4.3.3 Space Heaters

7.4.3.3.1 When heating an occupied area, heaters shall be of the indirect-fired type with combustion exhaust gases discharged to the outside atmosphere.

a. If direct-fired units are used or if combustion gases do not discharge outside, a monitoring program for toxic gases shall be established which is acceptable to the responsible safety organization.

7.4.3.3.2 Portable heaters requiring liquid or gaseous fuel shall not be located within facilities.

a. They shall be located outside with the heated air ducted to the point-of-use.

7.4.3.3.3 Heaters of the pot type shall be prohibited, as are open fires or fires in open end drums.

a. Heater combustion controls shall be UL listed or American Gas Association (AGA) approved.
b. If AGA approval is accepted in lieu of UL listing for combustion controls, the full complement of personnel safety devices required for UL listing shall be provided.

7.4.3.3.4 Permanent fixed boilers, fixed heaters, or heaters without watchmen or heater tenders shall be equipped with the full complement of combustion controls.

7.4.3.4 Heater Fuel Supply and Storage

7.4.3.4.1 Oil or liquefied petroleum gas (LPG) fuel supply tanks for heaters shall be installed or contained outside of facilities or enclosures.

a. Fuel lines shall be protected against mechanical damage.

7.4.3.4.2 If installing the tanks above ground is necessary, they shall be labeled with their contents.

a. “No Smoking” labels shall be placed on them
b. Barricades shall be placed around them.
c. Such tanks shall meet the requirements of NFPA 30 or NFPA 31.

Verify the correct revision before use by checking the LMS Web site.

7.4.3.4.3 LPG supply tanks of less than a 125-gallon aggregate cylinder content shall be installed in racks immediately outside an enclosure.

7.4.3.4.4 LPG supply tanks equal to or greater than a125-gallon aggregate cylinder content Larger supply tanks shall be installed in accordance with NFPA 58.

7.4.3.4.5 The fuel supply tank shall be permitted to be an integral part of the heating unit if the minimum distance separating it from any combustible material is 10 feet.

a. Such units shall be shut down and cooled before being refueled or moved.

7.4.3.5 Temporary Portable Electric Heaters

7.4.3.5.1 Before requesting a portable heater, all options available to improve comfort and to ensure maximum efficiency and conservation of energy through existing fixed systems shall be examined.

a. Facility managers shall investigate ways to improve the central heating distribution. If, as a final solution, a portable heater is necessary in an area, two major safety concerns shall be considered:
   (1) Portable heaters are an additional ignition source and shall be well separated from all combustible materials.

   Note: Portable heaters produce an additional electrical load which may cause an overload in the existing electrical circuits and cause conduit breakers to trip. This interrupts power to the circuit, which may be serving a computer, lights, or other electrical appliance.

7.4.3.5.2 With respect to these safety concerns and applicable safety and fire protection requirements, the following instructions have been established for the selection and use of temporary portable electric heaters:

a. Approval for use shall be obtained from the AHJ and cognizant Facility Coordinator/Facility Safety Head.
b. The heater shall be approved by a nationally recognized testing/certification laboratory such as UL.
   (1) Only oil-filled portable electric heaters not exceeding 1800 watts will be approved.
c. Due to the additional electrical load, the proposed heater usage shall be reviewed by an electrician to verify that the circuit is not overloaded. Some facilities have specific electrical load restrictions which shall be adhered to.
d. The location of the unit shall be considered.
   (1) The heater shall not be placed against combustible materials or where a tripping hazard may be created because of the unit or its electrical cord.
e. Administrative controls shall be implemented to ensure the unit is unplugged or turned off when space being heated is unoccupied.

Verify the correct revision before use by checking the LMS Web site.

7.4.4 RESPONSIBILITIES

7.4.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this procedure are followed

7.4.4.2 Facility Coordinator and/or Facility Safety head shall contact the LaRC AHJ prior to the use of portable heating equipment.

7.5 FIRE PROTECTION DURING CONSTRUCTION

7.5.1 PURPOSE

7.5.1.1 This section prescribes minimum fire protection safeguards for construction and demolition activities, including alteration and demolition.

7.5.2 SCOPE

7.5.2.1 This section shall apply to all construction and demolition activities at LaRC including operations performed by NASA and contract personnel.

7.5.3 REQUIREMENTS

7.5.3.1 Preconstruction Conference

7.5.3.1.1 A Preconstruction conference shall be held prior to the initiation of construction and demolition activities.

a. This conference shall pass along fire related issues.
b. This conference shall be done as part of the Safety Construction Briefing given to contractors before they can begin work.

7.5.3.1.2 Items to be discussed in the preconstruction meeting shall include:

a. Emergency and business telephone numbers for the LaRC Fire Department
b. Requirements for construction contractor-provided fire extinguishers
c. Use of specified fire hydrants in accordance with Section 5.4 of this document
d. Smoking policy (cessation of smoking 30 minutes prior to end of shift)
e. Pre-entry inspection of construction vehicles
f. Transport and storage of flammable liquids:
    (1) Capacity of 5 gallons or less shall be transported only in approved safety containers
    (2) No bulk storage of flammable liquids shall be permitted without LaRC AHJ approval
g. Requirements for accumulation of combustibles, form lumber, forms, waste, and debris
h. Temporary heating equipment
i. Other items pertaining to fire protection/prevention needed for the specific job

Verify the correct revision before use by checking the LMS Web site.

7.5.3.2 Safety Plan

7.5.3.2.1 A safety plan shall be included in all construction or demolition projects

7.5.3.2.2 The construction safety inspector, LaRC Fire Chief, and fire department station officer have the authority to enforce the plan even though the facility, during construction, is under the jurisdiction of the construction contractor. Upon request by the LaRC Fire Chief, the construction contractor shall conduct a construction area tour for emergency response personnel.

7.5.3.2.3 The plan shall include full compliance with requirements set forth in NFPA 241 as well as the following:

a. Good housekeeping practices in accordance with Section 7.9 of this document.
b. Installation of new fire protection systems as construction progresses.
c. Preservation of existing fire protection systems during demolition.
d. A prefire plan developed with assistance from the LaRC Fire Department station officer in accordance with Section 10.9 of this document.
e. Rapid notification of fires in accordance with Section 7.10 of this document.
f. Consideration of special hazards resulting from previous operations:
    (1) Any cutting, welding, or other types of hot work at construction sites comply with Section 7.3 of this document.
    (2) The storage of flammable compressed gases at construction sites complies with Section 8.3 of this document.

7.5.4 RESPONSIBILITIES

7.5.4.1 LaRC Fire Chief or Designee shall:

a. Answer questions relative to fire protection/prevention asked by construction contractor.
b. Enforce the construction fire safety plan with assistance from the construction safety inspector.

7.5.4.2 Construction Safety Inspector shall:

a. Enforce the construction fire safety plan with assistance from the LaRC Fire Chief (or Designee).
b. Attend preconstruction meeting.
c. Discuss fire protection and prevention policies with construction contractor.
d. Answer questions relative to fire protection/prevention asked by construction contractor.

7.6 STANDARD FIRE SYMBOLS FOR LARC

7.6.1 PURPOSE

7.6.1.1 This section establishes the requirements for the posting of symbols to identify the most severe hazard(s) associated with materials stored in a facility or storage site in order to alert responding fire fighters of the expected hazards and to identify outside fire protection equipment.

Verify the correct revision before use by checking the LMS Web site.

7.6.2 SCOPE

7.6.2.1 This section shall apply to all facilities at LaRC.

7.6.3 REQUIREMENTS

7.6.3.1 General

7.6.3.1.1 All new facilities shall have their storage areas posted with the NFPA 704 symbols to identify hazardous products or storage areas.

a. Any posting of the 704 symbol on existing facilities shall comply with 7.7.3.2.

7.6.3.2 NFPA 704 Posting

7.6.3.2.1 The NFPA 704 diamond shall be divided into four intrinsic diamonds, each representing the four hazard categories. The left-hand diamond represents the health hazard of the material within the facility. The top diamond represents the flammability hazard of the material within the facility. The right-hand diamond represents the reactivity hazard of the material within the facility. The bottom diamond provides special information relative to the material in the facility.

7.6.3.2.2 Each of the four diamonds of the main symbol shall be color coded.

a. The background color of the diamond representing the health hazard shall be blue.
b. The background color of the diamond representing the flammability hazard shall be red.
c. The background color of the diamond representing the reactivity hazard shall be yellow.
d. The background color for the diamond providing special information shall be white.

7.6.3.2.3 Each hazard category shall be assigned a hazard classification based on the properties of the material. Table 7.1 lists the five classifications of hazards and the general meaning to fire fighters.

a. The hazard classification for each hazard category shall be placed within the diamond representing the respective hazard category.

7.6.3.2.4 The assigned hazard classification shall reflect the most severe hazard expected in the area, whether it be from material itself or breakdown products of the material.

7.6.3.2.5 The color of each number representing the hazard classification shall be black.

7.6.3.2.6 The size and location of the diamond shall comply with recommendations contained in NFPA 704.

Verify the correct revision before use by checking the LMS Web site.

7.6.3.3 Table 7.1, Degrees of Hazards

DEGREE OF HAZARD	HAZARD INVOLVED
4	Fire is too dangerous to approach with standard fire fighting equipment and procedures. Withdraw and obtain expert advice.
3	Fire can be fought using methods intended for extremely hazardous situations, such as remote-control monitors or personal protective equipment that prevents bodily contact.
2	Fire can be fought with standard procedures, but hazards are present that can be handled safely only with certain special equipment or procedures.
1	Nuisance hazards are present that require some care, but standard fire fighting procedures can be used.
0	No special hazards are present.

7.7 CONTROL OF COMBUSTIBLES

7.7.1 PURPOSE

7.7.1.1 This section establishes administrative controls for combustibles (transient fire loads [TFLs]) at LaRC and to ensure that provisions are adequate for fire prevention, control, and suppression.

7.7.2 SCOPE

7.7.2.1 These controls and protection philosophies shall apply to safety related systems, high-value structures, and sensitive components.

a. They shall be extended to other areas to the extent possible.

7.7.3 REQUIREMENTS

7.7.3.1 General

7.7.3.1.1 The control of TFLs is essential to the defend-in-place fire protection philosophy for safety related systems, structures, and components and to prevent economic loss due to exposure fires to auxiliary facilities and equipment necessary for LaRC operation.

7.7.3.2 Normal Combustibles

Verify the correct revision before use by checking the LMS Web site.

7.7.3.2.1 The location of TFLs in safety related areas shall be restricted to minimize potential fire hazard exposures to safety related cables, equipment, and fire rated barriers.

a. TFLs shall not be positioned within 6 feet of a fire door, measured perpendicularly.

7.7.3.2.2 The LaRC AHJ shall ensure that the total transient and permanent fire loading in any safety related area does not exceed the capabilities of the installed fire protection systems and equipment as outlined in the fire hazard analysis (FHA), except in approved controlled conditions where adequate supplemental protection and supervision are provided.

a. In safety related areas where there is a heavy concentration of safety related cables or equipment protected by fixed fire protection systems for those specific hazards, no credit shall be taken for those systems to provide extinguishment capability for the TFLs.
b. TFLs, when allowed in these areas, shall be strictly controlled and require adequate protection measures, such as supplemental fire protection and/or fire watches.

7.7.3.2.3 The LaRC Fire Department station officer shall perform and document LaRC inspections to determine the adequacy of the TFL controls.

a. Deficiencies shall be identified and documented, and corrective action shall be promptly pursued.
b. The appropriate Facility Coordinator and/or Facility Safety Head shall be advised when it is determined that TFL precautions do not meet section requirements.

7.7.3.2.4 Equipment located in areas that requires periodic replenishment with combustible material (e.g., lubricating oil, charcoal filters) shall be controlled as follows:

a. Only the replenishment amount that will be used during the work shift shall be brought into the area.
b. Used combustible materials such as dirty oil and spent filters shall be removed from the safety related area when work is completed and taken to a suitable location for storage or disposal.

7.7.3.2.5 Waste, debris, scrap, rags, oil spills, or other combustibles resulting from the work activity shall be removed from areas following the completion of the activity, or at the end of each work shift, whichever is sooner.

7.7.3.2.6 Paper, dirty dress out gear, and other trash which has been bagged for removal shall not be left to accumulate in safety related areas.

a. This material shall be removed or placed in an approved storage location at the end of each shift.
b. Storage locations inside safety related areas shall be approved by the LaRC AHJ in accordance with the controls of this section.

7.7.3.2.7 The use of welding/burning equipment shall be in accordance with Section 7.3 of this document.

Verify the correct revision before use by checking the LMS Web site.

7.7.3.2.8 Equipment or supplies shipped in untreated combustible packaging or containers shall be unpacked in safety related areas only if:

a. A continuous fire watch has been established in accordance with Section 7.4 of this LPR.
b. A valid reason exists for equipment and supplies not being unpacked in an area separate from the safety related area (e.g., sensitive equipment, material handling, or fragility).
c. All combustible packing materials and containers shall be removed immediately following unpacking.
d. Loose combustible packing materials, such as wood or paper excelsior or plastic sheeting, shall have been placed in metal containers with tight fitting, self-closing metal covers until removal from the area.

7.7.3.2.9 Gasoline, liquefied petroleum gas (LPG), or diesel operated vehicles that enter any safety related area shall have met the requirements of this section.

7.7.3.2.10 Insulation on high-temperature casings or pipes that become soaked or suspected of being soaked with hydraulic fluids shall be replaced as soon as possible.

Note: Generally, hydraulic fluids have an auto ignition temperature of 1150 ℉, but when soaked into insulation, this fluid will ignite at temperatures as low as 600 ℉.

a. Cleanup of all spills and elimination of all leaks that may soak insulation in high-temperature casings or pipes shall be undertaken immediately.

7.7.3.2.11 Rags shall be removed from safety related areas at the completion of the work and taken to a suitable location for disposal.

a. Care shall be taken to prevent accumulation of rags in the safety related area while work is in progress.
b. Soiled rags in safety related areas shall be temporarily stored in covered metal containers.

7.7.3.2.12 Work activities shall be evaluated by the LaRC AHJ or designee to determine if additional controls are required to minimize the additional fire load.

7.7.3.2.13 Ion exchange resins shall not be stored in areas that contain or expose safety related equipment.

7.7.3.3 Flammable/Combustible Liquids or Gasses

7.7.3.3.1 Flammable or combustible liquids shall not be stored in safety related areas of LaRC.

a. Incidental use shall be controlled by the requirements of Section 8.2 of this document.

7.7.3.3.2 Compressed gas cylinders containing flammable gases shall meet the requirements of Section 8.3 of this document.

7.7.3.4 Building Materials

Verify the correct revision before use by checking the LMS Web site.

7.7.3.4.1 Fire retardant, pressure treated lumber and any other related combustible materials that are to be used in any area of LaRC for temporary structures shall be in accordance with Section 8.12 of this document.

7.7.3.4.2 The use of nonpressure treated wood materials and other combustible building materials shall be prohibited unless specifically evaluated and approved by the LaRC AHJ.

7.7.4 RESPONSIBILITIES

7.7.4.1 LaRC AHJ or Designee shall:

a. Interpret the guidelines in this section and specifies the controls and protective measures required by the TFLs introduced.
b. Process the TFL in accordance with this document section.

7.8 HOUSEKEEPING PRACTICES TO MINIMIZE FIRE LOSS

7.8.1 PURPOSE

7.8.1.1 This section establishes good housekeeping practices to minimize the risk of life and property losses from fire.

7.8.2 SCOPE

7.8.2.1 This section shall apply to all LaRC personnel, subcontractors, and visitors.

7.8.3 REQUIREMENTS

7.8.3.1 General

7.8.3.1.1 Housekeeping comprises the basic aspects of facility care and maintenance, cleanliness and order, and control of operating supplies and wastes.

7.8.3.1.2 The housekeeping program shall include, but is not limited to the following:

a. Control of operating supplies and wastes.
b. Use and storage of flammable and combustible materials.
c. Control of daily working supplies of flammable and combustible materials in the workplace.
d. Daily removal of waste and packaging materials.
e. Daily inspection of assigned areas to detect and correct problems.

7.8.3.1.3 Storage and use of hazardous chemicals shall be in accordance with Section 8.16 of this document.

7.8.3.1.4 Each facility shall be inspected to ensure general housekeeping practices are met by practicing the following requirements.

Verify the correct revision before use by checking the LMS Web site.

7.8.3.2 Storage and Removal of Rubbish (Trash)

7.8.3.2.1 Approved trash receptacles/containers shall be provided for rubbish.

7.8.3.2.2 Trash containers shall have either self-closing lids or are of the self-extinguishing type (flame arrestor).

7.8.3.2.3 Trash carts shall have the doors closed when not in use.

7.8.3.2.4 Trash carts shall be emptied into dumpsters before overflowing or before the end of the work shift.

7.8.3.2.5 Trash carts shall be staged in the areas approved and designated for these receptacles.

7.8.3.2.6 Combustible wastes shall not be allowed to accumulate in the work bays, in cells, or outside of waste receptacles.

7.8.3.2.7 Trash cans and recycle containers shall not be stored in stairways.

7.8.3.2.8 Specific guidelines on the handling, storage, and disposal of Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCRA) regulated waste shall be followed.

7.8.3.3 Maintaining Areas Around Fire Protection Equipment Free of Stored Materials or Equipment

7.8.3.3.1 Exits and exit accesses shall be clear and unobstructed.

7.8.3.3.2 Fire doors shall be kept clear of obstructions to ensure operation.

7.8.3.3.3 Access to portable fire extinguishers, sprinkler system control valves, and manual actuation devices shall be clear and unobstructed.

7.8.3.3.4 Sprinkler heads shall not be obstructed by equipment or stored materials.

a. A minimum vertical clearance of 18 inches shall be maintained between sprinkler heads and equipment or storage.

7.8.3.3.5 Fire hydrants shall be accessible at all times, free of weeds and other obstructions.

7.8.3.3.6 Fire alarm control panels shall be clear and unobstructed at all times.

7.8.3.4 Prevention of Excessive Combustible Loading

Verify the correct revision before use by checking the LMS Web site.

7.8.3.4.1 Combustible materials shall be controlled in accordance with Section 7.8 of this document.

7.8.3.4.2 Dust and oil mops shall be stored to ensure adequate ventilation in order to prevent spontaneous ignition.

7.8.3.4.3 Areas between facilities shall be maintained so they are clear of combustible materials, such as stored lumber, rubbish, or weeds.

7.8.3.5 Maintaining Electrical Equipment in Good Condition

7.8.3.5.1 Electrical wall plates and junction and outlet box covers shall be in place and tight.

7.8.3.5.2 Equipment shall be grounded.

7.8.3.5.3 Extension cords shall be listed by a recognized testing laboratory.

7.8.3.5.4 Extension cords shall be in good condition, not abraded or worn.

7.8.3.5.5 Lights shall have protective covers in place.

7.8.3.6 Maintaining Smoking Areas in Acceptable Order

7.8.3.6.1 An acceptable number of receptacles shall be provided.

7.8.3.6.2 Ash trays shall not be dumped into waste paper or trash receptacles:

7.8.3.6.3 Ash trays shall be emptied into a separate metal container daily.

7.8.3.6.4 The metal container shall be used for dispose of smoking materials.

7.8.4 RESPONSIBILITIES

7.8.4.1 Facility Coordinator and/or Facility Safety Head shall:

a. Enforce an effective housekeeping program within areas of his or her responsibility.
b. Ensure that unsafe conditions are corrected immediately.

7.8.4.2 LaRC Fire Chief shall:

a. Observe housekeeping conditions of facilities during routine inspections
b. Report unsafe conditions to the Facility Coordinator and/or Facility Safety Head.
c. Close facility or area if unsafe conditions cannot be immediately corrected.
d. Conduct facility assessments.

Verify the correct revision before use by checking the LMS Web site.

7.9 FIRE NOTIFICATION/FACILITY EVACUATION

7.9.1 PURPOSE

7.9.1.1 This section establishes the requirements for notifying the LaRC Fire Department of fires and provides personnel with the minimum information necessary to evacuate a facility in fire situations at LaRC.

7.9.2 SCOPE

7.9.2.1 This section shall apply to all LaRC employees, subcontractors, and visitors.

7.9.3 REQUIREMENTS

7.9.3.1 Any person observing a fire or explosion shall promptly evacuate the affected area or facility as quickly as possible, and if possible, activating a manual fire alarm pull station on the way outside should the fire alarm not already be sounding.

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

a. All personnel, except those assigned to operations where evacuation presents a more serious hazard than sheltering in place, shall immediately leave the area.
b. The person(s) to remain shall be determined by the Facility Coordinator and/or Facility Safety Head and approved by AHJ.

7.9.3.3 If the fire is in its incipient stage an employee shall use a fire extinguisher to put out the fire if the following conditions are met:

a. Building is being evacuated (fire alarm sounding)
b. Fire Department is being called (assume YES if fire alarm sounding)
c. Fire is small and contained
d. Exit is clear and you can fight fire with your back to the exit
e. Proper type of extinguisher is available
f. You are trained and confident about using the extinguisher
g. You can stay low and avoid breathing smoke, approach upwind

7.9.3.4 All personnel shall proceed to the safest and most convenient mustering station assigned for that facility standing by for further instructions.

7.9.3.5 Once at your mustering point and safe, someone in your group should promptly call 911 or call 757-864-2222 from a cell phone to relay the following type of information:

a. Exact location of fire or explosion.
b. Type of fire or explosion (e.g., material involved).
c. Whether explosives or highly flammable substances are present and, if so, the identity of the substances.
d. Progress of fire and how long it has been burning.

Verify the correct revision before use by checking the LMS Web site.

e. Name of individual reporting fire or explosion.
f. Any other pertinent information requested by the dispatcher.
   (1) Phone number
   (2) Personnel requiring assistance

7.9.3.6 The buddy system shall be used to assist physically challenged personnel (whether temporary or permit) in evacuating the facility/area during evacuations. A person of adequate strength shall be assigned (by FSH\FC) to each physically challenged employee to assist in evacuation. Responding emergency forces shall be notified if physically challenged personnel require assistance with evacuation. Some NASA LaRC facilities have ADA Area of Rescues. This area shall be used as a shelter in place location for mobility changed individuals.

7.9.3.7 All fire alarms and fire drills shall coordinate with the Facility Coordinator and/or Facility Safety Head.
a. A person may be designated to monitor the secure area(s) when time does not permit for classified material to be placed in secure repositories (this applies only to fire drills).

7.9.3.8 Fire drills shall be held at least annually in all occupied facilities with (10) ten employees or more.

7.9.3.9 Fire drills shall be conducted on a random basis by the LaRC Fire Department station officer.

7.9.3.10 A drill report shall be completed by the LaRC Fire Department station officer for each drill conducted and logged on the ATS System.

7.9.4 RESPONSIBILITIES

7.9.4.1 LaRC Employees, Subcontractors, and Visitors shall:
a. Notify the LaRC emergency fire dispatcher of any observed fire or explosion by dialing 911 from Center phone or 757-864-2222 from Cell phone.
b. Know evacuation routes and mustering stations for facilities where normally assigned.
c. Contact Facility Coordinator or Facility Safety Head for evacuation routes and mustering stations when working in areas different than normally assigned location.

7.9.4.2 LaRC Fire Chief shall:
a. Ensure that a continually staffed EDO is provided to receive incoming telephone, radio, or coded messages relative to fire or explosion reports.
b. Ensure quick responses to all fires or explosions at LaRC.
c. Ensure familiarity with facility layouts by conducting preplans.
d. Schedule and conduct fire drills.
e. Complete drill report after fire drill has been conducted.
f. Assess and approve, through coordination with LaRC AHJ, all mustering station/assembly point locations.

Verify the correct revision before use by checking the LMS Web site.

7.9.4.3 Facility Coordinator and/or Facility Safety Head shall:

a. Know the evacuation routes and all mustering stations for his or her work areas.

b. Inform employees of the following:
   (1) Location of emergency exits.
   (2) Evacuation routes and procedures.
   (3) Evacuation alarm signals.
   (4) Locations of mustering stations.

c. Direct LaRC Fire Department personnel to the location of the fire and convey the nature of the fire (from outside of the facility).

7.10 EMPLOYEE FIRE PROTECTION TRAINING

7.10.1 PURPOSE

7.10.1.1 This section establishes the information, relative to the LaRC fire protection program, to be included in General Employee Training.

7.10.2 SCOPE

7.10.2.1 This section shall apply to all new hire employees and contractors required to receive General Employee Training at LaRC.

7.10.3 REQUIREMENTS

7.10.3.1 Each employee shall receive training of the following topics: (This is part of the New Employee Video and Safety Construction Briefing given to new employees and contractors)

a. LaRC evacuation procedures.
b. LaRC smoking policies.
c. Notification and reporting of fires at LaRC.
d. Emergency telephone numbers for reporting fires and medical emergencies at LaRC.

7.10.3.2 Employees who request fire extinguisher education shall include the discussion of the following topics: (Only if training is requested)

a. Four types of fire extinguishers available at LaRC.
b. Four classes of fires.
c. Proper procedures if employee discovers a fire at LaRC.
d. How to use a portable fire extinguisher.

7.10.4 RESPONSIBILITIES

7.10.4.1 LaRC Fire Chief shall:

a. Develop training material relative to fire protection for General Employee Training.
b. Review and revise training material as necessary.

Verify the correct revision before use by checking the LMS Web site.

c. Ensure that training sessions relative to fire protection are conducted during scheduled employee training course.
d. Obtain necessary audiovisual aids and printed material to be used by the trainer.

7.11 FIRE PROTECTION IN FACILITY OPERATING PROCEDURES

7.11.1 PURPOSE

7.11.1.1 This section ensures that fire protection standards and the accompanying guides are incorporated into LaRC facility operating procedures.

7.11.2 SCOPE

7.11.2.1 This section shall apply to all facility operating procedures which are developed for use at LaRC.

7.11.3 REQUIREMENTS

7.11.3.1 The fire protection standards are compulsory. In some instances, the fire protection standard will refer to another code or standard. In those instances where a fire protection standard refers to another code or standard, this reference shall be deemed compulsory.

7.11.3.2 New or revised operating procedures shall include the applicable requirements of these fire protection standards.

7.11.3.3 New and revised operating procedures which affect fire protection program issues shall be reviewed by the LaRC AHJ.

7.11.3.4 SFAB Manager shall ensure that new operating procedures incorporate fire protection criteria.

7.11.3.5 LaRC AHJ shall assist procedure developer, as requested, in determining if new procedure will affect the fire protection program and review and approve procedures affecting fire protection aspects.

Verify the correct revision before use by checking the LMS Web site.

CHAPTER 8

8. FIRE HAZARD PROTECTION

8.1 ELECTRICAL INSTALLATION IN HAZARDOUS LOCATIONS

8.1.1 PURPOSE

8.1.1.1 This section establishes the requirements controlling the installation and use of explosion proof electrical systems and equipment at LaRC.

8.1.2 SCOPE

8.1.2.1 This section shall apply to the design, operation requirements, and responsibilities for explosion proof electrical installations.

8.1.3 REQUIREMENTS

8.1.3.1 NFPA 70, Articles 500 through 504 cover the requirements for electrical equipment and wiring for all voltages in locations where fire or explosion hazards may exist due to flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings.

8.1.3.2 Locations shall be classified depending on the properties of the flammable vapors, liquids or gases, or the combustible dusts or fibers that may be present and on the likelihood that a flammable or combustible concentration or quantity is present.

a. Each room, section, or area shall be considered individually in determining its classification.

8.1.3.3 Explosion proof electrical equipment of the proper classification shall be provided in locations where flammable vapors, liquids, gases, or combustible dusts or fibers may be present in concentrations sufficient to produce explosive or ignitable mixtures.

8.1.3.4 All explosion proof electrical equipment used shall be UL listed or FM approved for use in the appropriate hazardous atmosphere.

8.1.3.5 No alterations or modifications shall be made to listed or approved equipment for hazardous locations.

a. If modifications are made, the equipment shall be void for use in a classified hazardous location.
b. Electrical wiring and equipment in these areas shall be approved by the LaRC Standard Practice Engineer for Electrical and the LaRC AHJ.

Verify the correct revision before use by checking the LMS Web site.

8.1.4 RESPONSIBILITIES

8.1.4.1 Facility Coordinator and/or Facility Safety Head shall:

a. Ensure that practices delineated in this section are followed.

b. Contact the LaRC AHJ prior to installation of new electrical systems and equipment or modification of existing electrical systems and equipment.

8.1.4.2 LaRC AHJ along with the SPE for Electrical shall evaluate locations requested for the installation of electrical systems and equipment and modifications to existing electrical systems and equipment.

8.2 FLAMMABLE AND COMBUSTIBLE LIQUIDS

8.2.1 PURPOSE

8.2.1.1 This section establishes the requirements for the safe use, storage, and handling of flammable and combustible liquids at LaRC.

8.2.2 SCOPE

8.2.2.1 This section shall apply to the use, storage, and handling of flammable and combustible liquids at LaRC.

8.2.3 REQUIREMENTS

8.2.3.1 General

8.2.3.1.1 Users of flammable/combustible liquids shall be familiar with the hazard classification for the purpose of complying with this section and NFPA 30.

8.2.3.1.2 Laboratory users of flammable/combustible liquids shall be familiar with the hazard classification for the purpose of complying with NFPA 45

8.2.3.1.3 All flammable and combustible liquid handling equipment and storage areas shall be labeled in accordance with Section 7.7 of this document.

8.2.3.2 Storage

8.2.3.2.1 Flammable or combustible liquids shall be stored in designated locations which have been approved by the LaRC Fire Chief or designee.

8.2.3.2.2 All flammable storage cabinet locations shall be approved by the LaRC AHJ.

Verify the correct revision before use by checking the LMS Web site.

8.2.3.2.3 Flammable/combustible liquids storage shall provide for segregation and/or separation from incompatible materials.

8.2.3.2.4 The storage of flammable and combustible liquid shall not obstruct corridors, aisles, or exit doors; and flammable/combustible liquids are not stored in exit enclosures (e.g., stairwells).

8.2.3.2.5 Flammable liquids shall be stored in UL listed or FM approved flammable liquids storage cabinets and safety cans. Exception: Oil-based paints, varnish, shellac, and similar substances may be stored in their approved shipping containers in designated storage locations and may be used from these containers:

a. When flammable liquid storage cabinets shall be used, not more than 120 gallons of Class I, II, and IIIA liquids are stored in the cabinet.
   (1) Of this total, not more than 60 gallons shall contain Class I and II liquids.
b. 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.
   (1) When flammable liquid storage cabinets are used, the vent openings shall be sealed with fitted metal bungs.
   (2) When the cabinets are required to be vented, they shall be vented to the outside.

8.2.3.2.6 When storage quantities exceed amounts outlined above, the liquids shall be stored in rooms or facilities complying with NFPA 30 and 29 CFR 1910.106.

8.2.3.2.7 Flammable materials or liquids shall be limited in quantity to the minimum amounts necessary to perform the operations for one shift.

a. All flammable materials or liquid shall be removed from the lab, Hangar, or shop at the completion of the work shift or day.
b. All flammable materials or liquid shall be stored in flammable storage lockers or other suitable location meeting NFPA flammable storage requirements.

8.2.3.2.8 Open containers of Flammable liquids (Class I Class 2 and Class 3B) shall not be left out unattended and shall comply with 8.2.3.2.7

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

a. Containers and drums which have contained flammable liquids shall have covers, caps, or bungs replaced immediately after emptying.
b. Bungs shall be replaced with pressure and vacuum relief vents once the sealed drum is opened.
c. Safety cans shall have self-closing caps and flame arrestor screens.
d. A dip tank or other similar open vessel used to hold flammable liquids shall be provided with a hinged metal cover arranged with fusible links to close automatically in case of a fire.
e. Portable containers for storage of flammable liquids shall not exceed 5 gallons.

Verify the correct revision before use by checking the LMS Web site.

8.2.3.2.10 In operating facilities, not more than a 1-day supply of flammable/ combustible liquid shall be stored in a single fire area outside of an approved flammable liquid storage cabinet.

8.2.3.3 Transferring, and Dispensing Flammable and Combustible Liquids

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

a. Hand-operated rotary pumps or metal faucets shall be used.

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

8.2.3.3.3 When dispensing or transferring flammable/combustible liquids, containers shall be bonded together and grounded to eliminate buildup of static electricity.

a. When transferring liquids between conductive containers, the containers shall be bonded with a wire.
b. The bonding wire or one of the containers shall be grounded.

8.2.3.3.4 During transfer of bulk quantities of flammable/combustible liquids, the transport tractor shall not be uncoupled from the tanker without approval of the LaRC AHJ.

8.2.3.3.5 When dispensing from drums, the drums shall be equipped with UL listed or FM approved dispensing devices.

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

8.2.3.3.7 When transferring Class I liquids in laboratories from containers of 5-gallon capacity or more, the transfer shall be made either from a separate area outside the facility or in a separate, inside storage room that complies with the requirements of NFPA 30 and 29 CFR 1910.106.

8.2.3.3.8 Mechanical ventilation shall be provided, which meets the following criteria, when transferring Class I liquids in non-laboratory areas:

a. The ventilation flow rate shall be 1 cubic foot per minute per square foot of floor area, but in no case less than 150 cubic feet per minute.
b. The intake and exhaust points shall be within 12 inches of the floor and are positioned at opposite sides or ends of the room.
c. A flow monitor or equivalent mechanism shall be provided so an audible alarm will sound if the ventilation system fails.

Verify the correct revision before use by checking the LMS Web site.

8.2.3.4 Using or Transporting Flammable or Combustible Liquids.

8.2.3.4.1 A UL listed or FM approved safety can shall be required when flammable or combustible liquids are used or transported in LaRC.

a. The use of 1-gallon glass or plastic containers for storage of flammable liquids shall be authorized by the LaRC AHJ or designee if the liquid either would be rendered unfit for its intended use by contact with metal or would excessively corrode a metal container and cause leakage.
b. A small approved plastic container shall be used to limit the quantity of flammable liquids taken into an area.
c. Class IA and IB liquids shall be stored in glass containers of not more than 1 gallon, if required for liquid purity or to avoid excessive corrosion of metal containers.

8.2.3.4.2 Each area where flammable or combustible liquids shall be stored or dispensed is marked with DANGER signs stating “NO SMOKING OR OPEN FLAMES.”

8.2.3.4.3 Combustible waste and residue shall be stored in closed, metal containers for daily disposal.

8.2.4 RESPONSIBILITIES

8.2.4.1 Facility Coordinator and/or Facility Safety Head shall:

a. Ensure that practices delineated in this section are followed.
b. Contact the LaRC AHJ prior to establishing new flammable and combustible liquids storage areas or modifying existing flammable and combustible liquids storage areas.

8.2.4.2 LaRC AHJ shall evaluate locations requested to be used as a flammable and combustible liquid storage areas and modifications to flammable and combustible liquids storage areas.

8.3 SAFE STORAGE AND USE OF FLAMMABLE GASES

8.3.1 PURPOSE

8.3.1.1 This section establishes the requirements for the use, storage, and handling of compressed gases at LaRC.

8.3.2 SCOPE

8.3.2.1 This section shall apply to the storage, transportation, identification, and use of compressed gases at LaRC.

Verify the correct revision before use by checking the LMS Web site.

8.3.3 REQUIREMENTS

8.3.3.1 Storage

8.3.3.1.1 Compressed gas cylinders in transit or storage shall be provided with protective valve caps and are secured in an upright position.

8.3.3.1.2 Gas cabinet design, placement, and venting shall be per NFPA 55 and International Fire code or as required by the AHJ.

8.3.3.1.3 All storage areas shall be clearly identified.

a. The storage of compressed gas cylinders within facilities shall be limited to the quantity required for daily operations unless additional quantities are permitted by the applicable National Fire Protection Association (NFPA) standard.

b. The storage of compressed gas cylinders outside of facilities shall be in accordance with the applicable NFPA standard.

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

a. Where gases of different types are stored at the same location, cylinders shall be grouped by types of gas.

8.3.3.1.5 Empty and full gas cylinders shall be segregated, and empty cylinders tagged "EMPTY."

8.3.3.1.6 "NO SMOKING" signs shall be posted around the storage rooms.

8.3.3.2 Operation

8.3.3.2.1 Compressed gas cylinders shall not be exposed to temperatures above 125□Fand are protected from direct sun and weather elements.

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

a. All gas cylinders shall be hydrostatically tested and marked to meet Department of Transportation (DOT) requirements.

Verify the correct revision before use by checking the LMS Web site.

8.3.3.2.3 At no time shall oxygen-acetylene torches be brought into, or stored inside of LaRC facilities due to the severe fire hazard they pose. Oxygen and acetylene cylinders must be separated, capped, and properly stored outdoors in an approved gas storage area except as provided below:

a. Exception No. 1: Oxy-acetylene torches being used under a valid, active "hot work" permit at a fixed location shall be left assembled if properly supported and fitted with correct pressure regulator.
b. Exception No. 2: Oxy-acetylene torches being used under a valid, active "hot work" permit at a non-fixed location shall be left assembled if properly supported and fitted with correct pressure regulator.

8.3.3.2.4 Gases shall not be mixed or transferred from one compressed gas cylinder to another. Cylinders are refilled only by trained personnel.

8.3.3.2.5 Cylinders shall not be lifted by magnetic devices or by their protective caps.
a. Cylinders shall be secured to a cradle or platform.
b. Cylinders shall never be dragged, dropped, or struck.

8.3.3.2.6 Compressed gas cylinders shall not come in contact with electrical circuits, open flames, or arcs.

8.3.3.2.7 Compressed gas cylinders shall not be used for any purpose other than compressed gas containment.

8.3.3.2.8 Gas from compressed gas cylinders shall not be used without approved reducing regulators.

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

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

8.3.3.2.11 All devices used on compressed gas cylinders shall comply with the American National Standards Institute (ANSI) and Compressed Gas Association Standards C-4 and V-1.

8.3.3.2.12 All compressed gas manifolds shall be designed in accordance with the applicable NFPA standards.

8.3.4 RESPONSIBILITIES

8.3.4.1 Facility Coordinator and/or Facility Safety Head shall:
a. Ensure that practices delineated in this section are followed.

Verify the correct revision before use by checking the LMS Web site.

b. Contact the LaRC AHJ prior to establishing new compressed gas storage areas or modifying existing compressed gas storage areas.

8.3.4.2 LaRC AHJ shall evaluate locations requested to be used as compressed gas storage areas and modifications to compressed gas storage areas.

8.4 FIRE PROTECTION FOR PORTABLE STRUCTURES

8.4.1 PURPOSE

8.4.1.1 This section establishes the requirements for the installation and use of portable structures at LaRC.

8.4.2 SCOPE

8.4.2.1 This section shall apply to all purchased, leased, or locally constructed portable structures at LaRC.

a. The requirements in this section shall apply to new portable structures, or existing portable structures where the use has been changed.
b. This does not apply to existing portable structures already in place and where the use remains unchanged.

8.4.3 REQUIREMENTS

8.4.3.1 Construction

8.4.3.1.1 A graded fire hazard analysis (FHA), meeting the requirements of Section 9.2 of this document, shall be performed for all portable structures where any one of the following conditions exist:

a. Creates a life safety hazard.
b. Contains a daycare or classroom.
c. Endangers the public or environment.
d. Replacement value (structure and contents) exceeds $1 million.
e. Is vital to a NASA program.

8.4.3.1.2 All trailers and mobile home units shall meet the appropriate construction, mechanical system, and electrical system installation requirements of ANSI A119.1 and 24 CFR 280.

a. Trailer/mobile home complexes that exceed 3000 square feet (278.71 square meters) shall meet all requirements for permanent structures listed in this document and local codes.
b. Requirements for smaller complexes shall be determined by the authority having jurisdiction (AHJ).

Verify the correct revision before use by checking the LMS Web site.

8.4.3.1.3 All portable structures shall meet the minimum requirements as specified in the BOCA National Building Code.

a. All portable structures used to support construction/ demolition operations shall be in accordance with NFPA 241 and 29 CFR 1926.
b. The use of portable structures for housing electronic computer and data processing systems shall meet the requirements of Section 8.10 of this document.

8.4.3.1.4 Trailers and mobile home units arranged for occupancy shall comply with the interior finish, concealed space and exit requirements of NFPA 101.

a. Trailers and mobile home units shall be located in accordance with NFPA 80A but in no case less than 25 feet (7.62 meters) from permanent facilities and 25 feet (7.62 meters) apart.

8.4.3.1.5 A complete fire detection and evacuation alarm system shall be provided.

8.4.3.1.6 Complete automatic sprinkler protection designed in accordance with the applicable NFPA standards shall be provided for portable structures as follows:

a. In all new structures over 5000 square feet.
b. In all structures having a maximum possible fire loss (MPFL) in excess of $1 million.
c. In all structures where the MPFL will affect a vital program for a period longer that that specified as acceptable by the LaRC Director.
d. In all structures where the quantities of hazardous materials used or stored exceed the limits delineated in the local fire code.
e. In all structures used for sleeping quarters, including daycare centers. (For such structures, “quick response” sprinklers should be utilized.) An exception is that limited supply suppression systems may be used where a reliable water supply is not available or where the application of water would increase the overall hazard in the event of a fire.

8.4.3.2 Anchors and Supports

8.4.3.2.1 Each portable structure shall have support and anchoring systems that will resist overturning and lateral movement of the unit.

a. Support and anchoring equipment shall be in accordance with the manufacturer’s specifications.

8.4.3.2.1 Deviations from approved stabilization plans shall be designed by a registered structural engineer.

a. Such designs shall carry the seal and signature of the registered engineer.
b. Such designs shall be reviewed and approved by LaRC SPE for Structure.

8.4.3.3 Skirting

8.4.3.3.1 Each portable structure shall have the area under the floor enclosed to prevent the accumulation of windblown debris and to prevent the space from being used for storage.

a. Semi trailers used exclusively for storage shall also require skirting.

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8.4.3.3.2 The skirting shall be of noncombustible material and without openings.

a. The only exceptions shall be service access doors and screened louvers installed for ventilation.

8.4.3.4 Pedestrian and Handicapped Access

8.4.3.4.1 All walkways shall be constructed of weather resistant materials except for those walkways used for temporary construction trailers.

a. Walkways shall be constructed of weather resistant lumber with a permanent nonskid surface.

8.4.3.4.2 There shall be means of egress from a portable structure discharges into a roadway or traffic flow area.

8.4.3.4.3 Stairs with platforms and handrails shall be provided for each exterior door.

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

a. Facilities provided for the physically handicapped shall be in accordance with the Americans with Disabilities Act (ADA).

8.4.3.4.5 Stairs, platforms, ramps, and handrails shall be arranged to resist movement.

8.4.3.4.6 Stairs, ramps, and platforms shall be constructed of steel, concrete, fiberglass, or other weather resistant materials.

a. All stairs shall comply with 29 CFR 1910 and NFPA 101.

8.4.3.4.7 Stairs, ramps, platforms, and walkways shall have a permanent nonskid walking surface.

8.4.3.5 Electrical

8.4.3.5.1 All electrical conductors and equipment shall be in accordance with the latest edition of NFPA 70, National Electric Code (NEC).

a. NEC Article 305 (Temporary Wiring) shall not apply to any wiring for trailers.
b. NEC Article 215 shall apply to all feeder circuits installed on-site.
c. Article 305-4(b) shall not apply.

8.4.3.5.2 All electrical conductors shall be copper.

8.4.3.5.3 All electrical circuits shall have a separate grounding wire.

a. The use of trailer frame or other metal parts shall not be permitted method of grounding.
b. All conductive parts of the portable structure, including frame and siding skirting shall be bonded (grounded) to the main circuit breaker box.

Verify the correct revision before use by checking the LMS Web site.

8.4.3.5.4 Any wiring presently being installed or installed after the portable structure has been delivered shall be in steel conduit and surface mounted.

a. Conduit shall not be used as the grounding path
b. Separate grounding wire shall be required.

8.4.3.5.5 All installed breakers shall be permanently identified for their use.

8.4.3.5.6 Main service disconnects shall be located on the outside of the portable structure and clearly identified.

8.4.3.6 Heating and Cooling Systems

8.4.3.6.1 Installed heating and cooling equipment shall be listed or labeled.

a. Equipment shall be installed in accordance with its listed design and appropriate standards.

8.4.3.6.2 Air duct and plenum materials shall be UL Class I or better.

8.4.3.6.3 Only electric or steam units shall be installed.

8.4.3.7 Exits

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

a. Other egress arrangements shall be permitted as specified by NFPA 101, Life Safety Code.

8.4.3.7.2 The minimum width of any main egress corridor serving multiple exit passageways shall be 44 inches.

8.4.3.7.3 The minimum width of any aisle serving to gain access to a corridor or exit passageway shall be 36 inches in the clear.

8.4.3.7.4 Passageways, aisles and corridors, serving as access to a required exit shall not be used for any purpose that could interfere with their intended use, including storage of boxes, file cabinets, desks, or trash containers.

8.4.3.7.5 No door opening in the means of egress shall be less than 32 inches in clear width.
8.4.3.7.6 Doors shall be arranged to be readily opened from the egress side whenever the structure is occupied.

Verify the correct revision before use by checking the LMS Web site.

8.4.3.7.7 Exits shall be marked by an approved sign readily visible from any direction of exit access.

a. An exception shall be the main exterior doors that are obviously and clearly identified as exits.

8.4.3.7.8 Every required exit sign shall be suitably illuminated by a reliable light source.

8.4.3.8 Emergency lighting

8.4.3.8.1 All portable structures having an occupancy of 50 persons or more or a total footage of 10,000 square feet shall be provided with emergency lighting.

8.4.3.9 Location of Portable Structures Inside Other Structures

8.4.3.9.1 Unprotected portable structures shall not be permitted inside permanent facilities where the combined potential loss exceeds $500,000.

8.4.3.9.2 Portable structures that have complete sprinkler systems shall be permitted inside permanent structures but are limited to 1000 square feet in floor area per unit.

a. Automatic sprinklers shall be positioned over and under the unit when materials that will burn or support combustion are present.

8.4.3.9.3 A minimum of 10 feet of clear space, free of combustibles, shall be maintained around each unit.

8.4.3.9.4 The location of portable structures shall not hinder safe movement of personnel in the permanent facility nor violate the requirements of NFPA 101, Life Safety Code.

8.4.3.10 Operation

8.4.3.10.1 Flammable and/or combustible liquids shall be kept to an absolute minimum

8.4.3.10.2 Flammable and/or combustible liquids shall be stored in and dispensed from UL listed or FM approved safety cans.

a. Flammable or combustible liquid-soaked clothes, rags, or waste shall be stored in UL listed or FM approved safety containers.

8.4.3.10.3 Combustible materials which are used in the portable structure shall <u>NOT</u> be allowed to accumulate.

a. All combustible waste shall be removed from the portable structure after each work shift.

8.4.3.10.4 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101 and 29 CFR 1926.

8.4.3.10.5 Cutting, welding, open flame, or grinding shall not be performed in portable structures without an approved permit in accordance with Section 7.3 of this document.

Verify the correct revision before use by checking the LMS Web site.

8.4.3.10.6 Access for use of heavy firefighting equipment shall be provided to the portable structure at the start of the project and is maintained until completion.

8.4.4 RESPONSIBILITIES

8.4.4.1 Facility Coordinator and/or Facility Safety Head shall:
a. Ensure that practices delineated in this section are followed.
b. Contact the LaRC AHJ prior to constructing or placing new portable structures.

8.4.4.2 LaRC AHJ shall evaluate Portable Structure location.
a. LaRC AHJ shall give or deny approval for use at this location.

8.4.4.3 LaRC AHJ shall review structure for compliance with this document.
a. LaRC AHJ shall give or deny approval for use at this Center.

8.5 FIRE PROTECTION FOR STORAGE FACILITIES AND AREAS

8.5.1 PURPOSE

8.5.1.1 This section establishes the requirements for controlling the construction and use of storage facilities at LaRC.

8.5.2 SCOPE

8.5.2.1 This section shall apply to all general storage facilities at LaRC.
a. This section shall not apply to current storage facilities unless the use has changed or the hazard in increased from its original approved usage.

8.5.3 REQUIREMENTS

8.5.3.1 Construction

8.5.3.1.1 Storage facilities shall be constructed in accordance with the applicable sections of the BOCA National Building Code and NFPA 101.

8.5.3.1.2 Storage facilities storing vital and important equipment or supplies shall be located in noncombustible facilities protected with automatic sprinklers.
a. Sprinkler systems installed in facilities used for solid pile, bin box, shelf, or palletized storage which is less than 12 feet in height shall be in accordance with NFPA 13.
b. Sprinkler systems installed in facilities used for solid pile, bin box, shelf, or palletized storage which is greater than 12 feet in height shall be in accordance with NFPA 231, NFPA 231C, and the applicable sections of NFPA 13.

Verify the correct revision before use by checking the LMS Web site.

8.5.3.2 Operation

8.5.3.2.1 Appropriate fire extinguishers shall be provided for storage facilities.

8.5.3.2.2 Good housekeeping, orderliness, and maintenance of equipment shall be provided for storage facilities.

8.5.3.2.3 Storage facilities shall be posted as “No Smoking” areas.

8.5.3.2.4 Storage facilities shall not be used as working spaces, except as approved by the LaRC AHJ.

8.5.3.2.5 Combustible materials which are used in the storage facility operations (e.g., files, films, paper products) shall be removed from the storage facilities immediately after use or stored in approved metal containers with lids.

a. All combustible waste shall be removed from the records storage facility after each work shift.

8.5.3.2.6 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

8.5.3.2.7 Cutting, welding, open flame, or grinding shall not be performed in storage facilities without an approved permit in accordance with Section 7.3 of this document.

8.5.3.3 Yard/Outdoor Storage

8.5.3.3.1 Yard/Outdoor storage shall only be permitted in designated locations.

a. The LaRC AHJ shall be notified prior to the establishment of new yard/outdoor storage locations in order to evaluate the site for determination of adequate protection and potential impact on the emergency evacuation of adjacent facilities / fire department access.

8.5.3.3.2 Clear aisles shall be maintained between the following.

a. Individual piles.
b. Piles and buildings.
c. Piles and boundary of yard/outdoor storage site.

8.5.3.3.3 All aisle widths shall be twice the pile height.

8.5.3.3.4 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.

8.5.3.3.5 Cutting, welding, or other operations involving the use of flame-, heat-, or spark-producing tools shall not be performed within 50 feet of any yard/outdoor storage area.

Verify the correct revision before use by checking the LMS Web site.

8.5.3.3.6 Portable heating devices shall not be used or located within yard/outdoor storage areas.

8.5.3.3.7 Smoking shall not be permitted in yard/outdoor storage areas.

8.5.3.3.8 Tarpaulins or other covers used to protect the stored materials from the weather shall be of fire retardant material.

8.5.3.3.9 Means of expediently notifying the LaRC Fire Department in case of fire shall be provided at all yard/outdoor storage locations.

8.5.3.3.10 Portable fire extinguishers shall be provided at conspicuous, accessible locations throughout all yard/outdoor storage.

8.5.3.3.11 Access to fire hydrants shall not be obstructed.

8.5.3.3.12 Yard storage areas shall be inspected to ensure that storage practices comply with the requirements of this section.

8.5.4 RESPONSIBILITIES

8.5.4.1 Facility Coordinator and/or Facility Safety Head shall:
a. Ensure that practices delineated in this section are followed.
b. Contact the LaRC AHJ prior to establishing new storage facilities*.

8.5.4.2 LaRC AHJ shall evaluate locations requested to be used as a storage facility.

8.6 FIRE PROTECTION FOR COMBUSTIBLE SOLIDS, METALS, AND DUSTS

8.6.1 PURPOSE

8.6.1.1 This section establishes the requirements for the use, storage, and handling of combustible solids, metals, and dusts at LaRC.

8.6.2 SCOPE

8.6.2.1 This section shall apply to the design, operation requirements, and personnel responsibilities in locations where combustible solids, metals, and dusts are stored, processed, or handled.

Verify the correct revision before use by checking the LMS Web site.

8.6.3 REQUIREMENTS

8.6.3.1 Design

8.6.3.1.1 Facilities handling or storing combustible solids, metals, and dusts shall be in accordance with the local building code and applicable National Fire Protection Association (NFPA) standards.

8.6.3.1.2 Whenever inert gas environment systems are used, a reserve supply of gas shall be available for emergency use.

8.6.3.2 Operation

8.6.3.2.1 The appropriate extinguishing agents shall be used where pyrophoric materials and combustible solids, metals, and dusts are processed, stored, or handled.

> *Note: Most pyrophoric materials react violently with water, foam agents, halogenated agents, and carbon dioxide gas. Some combustible metals cannot be extinguished with water and require special extinguishing powders (for Class D fires) or special inert gases.*

8.6.3.2.2 Processes involving pyrophoric materials shall be performed in an enclosed, oxygen free, oxygen deficient, or inert atmosphere that is moisture-controlled (dry).

8.6.3.2.3 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.

8.6.3.2.4 Smoking and uncontrolled use of open flames shall be prohibited where combustible solids, metals, and dusts are processed, stored or handled.

a. Areas shall be clearly posted with “NO SMOKING” signs.

8.6.3.2.5 Nonsparking tools shall be used when handling combustible metal dusts.

8.6.3.3 Pyrophoric Materials

8.6.3.3.1 Plans for a designated pyrophoric materials storage area shall be forwarded to the LaRC AHJ for approval.

8.6.3.3.2 Class D portable fire extinguishers shall be provided and located so that the travel distance to an extinguisher does not exceed 75 feet.

Verify the correct revision before use by checking the LMS Web site.

8.6.3.3.3 Other combustible materials shall not be stored in the designated pyrophoric materials storage area.

a. This designated storage area shall be separated from storage of Class A combustible materials by at least 30 feet, or
b. Fire walls with a 2-hour rating shall be provided.
c. Any opening in this wall shall be protected by listed, 1½-hour, automatically closing fire doors.
d. The designated storage area shall be separated from combustible liquids storage by at least 50 feet, or
e. Fire walls with a 4-hour rating shall be provided.
f. Any opening in this wall shall be protected by listed, 3-hour, automatically closing fire doors on both sides of the opening.
g. Appropriate secondary confinement shall be provided to prevent any spilled liquids from entering the designated storage area.
h. Noncombustible materials in noncombustible containers on metal pallets shall be permitted to be stored in the separation space.

8.6.3.3.4 Smoking and uncontrolled use of open flames shall be prohibited in the pyrophoric materials storage area.

8.6.4 RESPONSIBILITIES

8.6.4.1 Facility Coordinator and/or Facility Safety Head shall:

a. Ensure that practices delineated in this section are followed.
b. Contact the LaRC AHJ prior to establishing new pyrophoric materials and combustible solids, metals, and dusts operations areas or modifying existing pyrophoric materials and combustible solids, metals, and dusts operations areas.

8.6.4.2. LaRC AHJ shall evaluate locations requested to be used as combustible solids, metals, and dusts operations areas and modifications to existing pyrophoric materials and combustible solids, metals, and dusts operations areas.

8.7 FIRE PROTECTION FOR CLEAN ROOMS

8.7.1 PURPOSE

8.7.1.1 This section establishes the requirements for the construction and use of clean room facilities at LaRC.

8.7.2 SCOPE

8.7.2.1 This section shall apply to all new clean room facilities, and those existing clean rooms that undergo significant renovation at LaRC.

Verify the correct revision before use by checking the LMS Web site.

8.7.3 REQUIREMENTS

8.7.3.1 Construction

8.7.3.1.1 NASA clean rooms shall be constructed and protected in accordance with the appropriate provisions of National Fire Protection Association (NFPA) 318 and FM Data Sheet 1-56.

8.7.3.1.2 Automatic fire suppression shall be provided throughout facilities containing clean rooms and clean zones.

a. Sprinklers shall be installed throughout all clean rooms regardless of classification.
b. Sprinkler temperature rating within the clean room shall be 130°F.
c. Special consideration may be given for installation of local application, gaseous suppression systems to protect special hazards.

8.7.3.1.3 Clean rooms shall be separated from adjacent occupancies by 1-hour fire resistant construction.

a. Operations within facilities shall be arranged in separate zones according to their clean room classification and in a manner compatible with operating efficiency.
b. The cutoff construction shall have a fire resistance commensurate with both the clean room and exposing area hazards and values.
c. Clean rooms shall be located to minimize external exposure from fires and other hazards.
d. Floors over clean rooms shall be made watertight.
e. Fire retardant plastic panels prone to producing large quantities of smoke shall not be used in the construction of clean rooms.
f. Noncombustible panels shall be used instead.
g. Benches and hoods shall be of noncombustible construction or protected with automatic sprinklers.

8.7.3.1.4 High-efficiency particulate air (HEPA) filtration systems shall be in accordance with Section 8.15 of this document.

a. Clean room ventilating ducts and equipment shall be constructed of noncombustible materials.

8.7.3.1.5 A complete fire detection and evacuation alarm system shall be provided in facilities containing clean rooms and clean zones.

8.7.3.1.6 When situations occur that in the judgment of the LaRC AHJ, conventional, prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level to safety to personnel and property and meet the spirit of this section. This shall include the use of clean fire suppression agent such as FM-200 or early detections systems such as VESDA.

Verify the correct revision before use by checking the LMS Web site.

8.7.3.2 Operation

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

8.7.3.2.2 Good housekeeping, orderliness, and maintenance of equipment shall be provided for clean room facilities.

8.7.3.2.3 Clean room facilities shall be posted as “No Smoking” areas.

8.7.3.2.4 Combustible materials which are used in the clean room facility operations shall be removed from the clean room facilities immediately after use, or

a. Combustible materials which are used in the clean room facility operations shall be stored in approved metal containers with lids.

8.7.3.2.5 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

8.7.4 RESPONSIBILITIES

8.7.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed.

8.7.4.2 LaRC AHJ shall evaluate clean rooms in accordance with this section.

8.7.4.3 COD shall ensure that all new clean room facilities or modifications to existing facilities meet the requirements of this section.

8.8 FIRE PROTECTION FOR AIRCRAFT HANGARS

8.8.1 PURPOSE

8.8.1.1 This section establishes the requirements for the construction and use of aircraft hangar facilities at LaRC.

8.8.2 SCOPE

8.8.2.1 This section shall apply to all aircraft hangar facilities at LaRC.

Verify the correct revision before use by checking the LMS Web site.

8.8.3 REQUIREMENTS

8.8.3.1 General

8.8.3.1.1 NASA aircraft hangars shall be constructed and protected in accordance with the provisions of National Fire Protection Association (NFPA) 409 and FM Data Sheets 7-93 and 7-93N.

8.8.3.2 Protection Systems

8.8.3.2.1 New hangars shall be protected by one of the following methods:

a. Overhead, foam-water deluge systems, utilizing aqueous film forming foam (AFFF), and designed in accordance with NFPA 409.
b. Overhead foam-water wet pipe sprinkler systems and AFFF monitor nozzles.

8.8.3.3 Construction

8.8.3.3.1 New aircraft hangars shall be of protected noncombustible construction with all principal supporting members protected by gypsum panels sufficient to achieve at least a 1-hour fire resistance rating.

8.8.3.3.2 In existing hangars, main structural elements need not be rendered fire resistant if the hangar is provided with a floor drainage system and is protected by a complete, automatic fire suppression system.

8.8.3.3.3 Aircraft ramps used for fueling operations shall be designed in accordance with NFPA 415.

8.8.3.4 Draft Curtains

8.8.3.4.1 Draft curtains shall be provided in accordance with the guidelines contained in NFPA 204M. The distance between curtains boards shall not exceed 100 feet.

8.8.3.5 Operation

8.8.3.5.1 Appropriate fire extinguishers shall be provided for aircraft hangar facilities.

8.8.3.5.2 Good housekeeping, orderliness, and maintenance of equipment shall be provided for aircraft hangar facilities.

8.8.3.5.3 Aircraft hangar facilities shall be posted as “No Smoking” areas.

Verify the correct revision before use by checking the LMS Web site.

8.8.3.5.4 Combustible and Flammable materials and liquids which may be 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.

a. Flammable and Combustible materials and liquids shall be removed from the aircraft hangar facilities immediately after use or shall be stored in approved flammable storage lockers.

8.8.3.5.5 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

8.8.3.5.6 Aircraft fuel servicing operations shall be in accordance with NFPA 407.

8.8.3.5.7 Aircraft maintenance operations shall be in accordance with NFPA 410.

8.8.3.5.8 Cutting, welding, open flame, or grinding shall not be performed in aircraft hangar facilities without an approved permit in accordance with Section 7.3 of this document.

8.8.4 RESPONSIBILITIES

8.8.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed.

8.8.4.2 LaRC AHJ shall evaluate aircraft hangars in accordance with this section.

8.8.4.3 COD shall ensure that all new aircraft hangar facilities or modifications to existing facilities meet the requirements of this section.

8.9 FIRE PROTECTION FOR FLIGHT SIMULATORS

8.9.1 PURPOSE

8.9.1.1 This section establishes the requirements for the construction and use of flight simulator facilities at LaRC.

8.9.2 SCOPE

8.9.2.1 This section shall apply to all new flight simulator facilities and existing flight simulator facilities undergoing significant renovation.

a. Existing flight simulators undergoing significant renovation shall comply with these requirements to the extent practicable.

Verify the correct revision before use by checking the LMS Web site.

8.9.3 REQUIREMENTS

8.9.3.1 Construction and Protection

8.9.3.1.1 NASA flight simulators shall be constructed and protected in accordance with the appropriate provisions of FM Data Sheet 7-3.

8.9.3.1.2. Facilities and rooms containing flight simulators as well as the training module shall be constructed of noncombustible materials.

8.9.3.1.3 The hydraulic fluid pump and reservoir shall be separated from other portions of the simulator facility by 1-hour fire resistant construction.

8.9.3.1.4 The training module for new simulators shall be protected by an approved automatic total-flooding fire extinguishing system to protect the cockpit, beneath the floor, behind the instrument panels, and inside the electronic switchgear and electronic data processing cabinets:

8.9.3.1.5 Actuation of the extinguishing system shall be done by ionization-type smoke detectors.

8.9.3.1.6 Electronic data processing equipment shall be in accordance with Section 8.10 of this document.

8.9.3.1.7 The hydraulic pump and storage facility shall be protected by automatic sprinklers over the hydraulic fluid pump room and storage facility.

8.9.3.1.8 The simulator system room and facility shall be protected with automatic sprinklers throughout all areas where there is combustible occupancy or construction or where hydraulic fluids are used.

8.9.3.1.9 Visual aid equipment shall require automatic sprinkler protection if the visual display is of combustible construction.

8.9.3.1.10 HEPA filtration systems shall be in accordance with Section 8.15 of this document.

8.9.3.1.11 A complete fire detection and evacuation alarm system shall be provided in facilities containing flight simulators.

a. The signaling system shall be fully supervised and arranged to sound an alarm at a constantly attended location.

8.9.3.1.12 When situations occur that in the judgment of AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section. This may include the use of clean fire suppression agent such as FM-200 or early detection systems such as VESDA.

Verify the correct revision before use by checking the LMS Web site.

8.9.3.2 Operation

8.9.3.2.1 Appropriate fire extinguishers shall be provided for flight simulator facilities in accordance with NFPA 10.

8.9.3.2.2 Good housekeeping, orderliness, and maintenance of equipment shall be provided for flight simulator facilities.

8.9.3.2.3 Flight simulator facilities shall be posted as “No Smoking” areas.

8.9.3.2.4 Combustible materials which are used in the flight simulator facility operations shall be removed from the flight simulator facilities immediately after use.

8.9.3.2.5 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

8.9.4 RESPONSIBILITIES

8.9.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed.

8.9.4.2 LaRC AHJ shall evaluate flight simulators in accordance with this section.

8.9.4.3 COD shall ensure that all new flight simulator facilities or modifications to existing facilities meet the requirements of this section.

8.10 FIRE PROTECTION FOR COMPUTER FACILITIES

8.10.1 PURPOSE

8.10.1.1 This section establishes the requirements for the installation and use of computer facilities at LaRC.

8.10.2 SCOPE

8.10.2.1 This section shall apply to computer facilities which meet one or more of the following conditions:

a. Designated as vital to the NASA mission.
b. Required for security.
c. Valued at $1 million or more.
d. Required for operations which could be performed by substitute methods but where the substitute methods would result in unacceptable delays or would involve significant additional expenditures of personnel, facilities, and equipment.

Verify the correct revision before use by checking the LMS Web site.

8.10.2.2 When situations occur that in the judgment of the AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section. This may include the use of clean fire suppression agent such as FM-200 or early detection systems such as VESDA.

8.10.3 REQUIREMENTS

8.10.3.1 Construction

8.10.3.1.1 All new computer facilities shall meet the minimum constructions requirements.

8.10.3.1.2 All new computer facilities shall be provided with the appropriate fire protection features specified in National Fire Protection Association (NFPA) 75 and NASA STD 8719.11, Section 703, except as modified herein.

8.10.3.2 Operation

8.10.3.2.2 Computer facilities with raised floors shall be provided with floor lifters which are mounted near the room exit door.

a. The area under the raised floor shall be inspected annually to assure that no combustibles have accumulated.

8.10.3.2.3 Employees who normally work in computer facilities shall be familiar with the fire protection systems in their work area.

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

8.10.4 RESPONSIBILITIES

8.10.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed and shall contact the LaRC AHJ prior to establishing new computer facilities or modifying existing computer facilities.

8.10.4.2 LaRC AHJ shall evaluate locations requested to be used as computer facilities and modifications to existing computer facilities.

8.11 FIRE PROTECTION FOR ANECHOIC CHAMBERS

8.11.1 PURPOSE

8.11.1.1 This section establishes the requirements for the construction and use of anechoic chamber facilities at LaRC.

Verify the correct revision before use by checking the LMS Web site.

8.11.2 SCOPE

8.11.2.1 This section shall apply to all new anechoic chamber facilities, and those undergoing significant renovation at LaRC.

a. Existing anechoic chamber facilities shall comply with the requirements listed below to the extent practicable.

8.11.3 REQUIREMENTS

8.11.3.1 General

8.11.3.1.1 No single protection approach is appropriate for all anechoic chambers. Because of the range of chamber sizes, purposes, contents, sensitivities and locations, a specific protection goal has been established and the following requirements developed to meet the criteria of NASA STD 8719.11.

8.11.3.1.2 Anechoic chambers shall be constructed and protected in accordance with the appropriate provisions of NASA STD 8719.11 and FM Data Sheets 1-53, 1-53S.1, and 1-53S.2, except as amended herein.

8.11.3.1.3 When situations occur that in the judgment of the AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section. This may include the use of clean fire suppression agent such as FM-200 or early detection systems such as VESDA.

8.11.3.2 Construction

8.11.3.2.1 Control rooms shall be separated from the chamber by partitions having a fire resistance rating of 1 hour.

Note: Higher fire resistance ratings may be required based on the fire hazards associated with the chamber.

8.11.3.2.2 Vision panels shall be no more than 9 square feet and are wired glass in steel frames.

8.11.3.2.3 Air conditioning systems or other chamber ducting shall be independent of main facility systems.

8.11.3.2.4 All new anechoic chamber foam materials shall meet the fire retardant criteria specified by FM.

8.11.3.2.5 Existing chambers with non-Naval Research Laboratory (NRL) foam shall be converted to NRL foam wherever possible.

Verify the correct revision before use by checking the LMS Web site.

8.11.3.2.6 Areas such as control rooms, concealed ceiling spaces, subfloor areas, and below pedestals shall be protected if combustibles are present.

a. Protection shall be consistent with the protection of the chamber.

8.11.3.2.7 Electrical equipment in the chamber shall be arranged as follows:

a. Power supplies shall be in conduit.
b. Outlets shall have watertight-type covers installed so that the spring-loaded cover is on the top when the outlet is in use.
c. Control cables shall have abrasion resistant, nonflammable insulation and screw-on or bayonet twist lock connectors.

8.11.3.2.8 If anechoic chambers are located in stories above other water damageable occupancies, their floors shall be watertight and built with curbs to protect against any penetration at the walls.

8.11.3.2.9 Floor drainage shall be incorporated into the design of new chambers as follows:

a. The drain outlets shall be arranged to drain to safe locations where other property will not be exposed to water damage.
b. The drainage system shall be designed with sufficient capacity to safely dispose of the sprinkler and hose stream water discharge during a fire.

8.11.3.2.10 Anechoic chambers shall be protected by a complete automatic sprinkler system.

8.11.3.2.11 Exception: Existing chambers shall be protected by a FM-200 or other suitable and approved gaseous fire extinguishing system.

8.11.3.2.12 The use of RF shielding gaskets in sprinkler systems shall be limited to those types that pose no obstruction to the waterway. If any portion of the gasket shall protrude into the pipe interior, the resulting friction loss should be established and taken into account in the hydraulic calculations.

8.11.3.2.13 The sprinkler system shall be designed in accordance with Table 8.1 and is controlled by a separate indicating-type control valve.

8.11.3.2.14 HEPA filtration systems shall be in accordance with Section 8.15 of this document.

8.11.3.2.15 A complete smoke detection system shall be provided in facilities containing anechoic chambers.

Verify the correct revision before use by checking the LMS Web site.

8.11.3.2.16 Table 8.1, Sprinklers for Anechoic Chambers

	SMOOTH SURFACES		GEOMETRIC SHAPES (Pyramids)		
Protection	Up to 10 in. thick (250 mm)	Over 10 in. thick (250 mm)	Up to 6 in. thick (150 mm)	6 to 12 in. thick (300 mm)	Over 12 in. thick (300 mm)
Automatic Sprinklers: 100-ft^2 coverage, 10-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.30-gpm/ft^2 (12-l/min/m^2) average density (Note 2)	X		X		
Automatic Sprinklers: 50-ft^2 coverage, 8-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.60-gpm/ft^2 (25-l/min/m^2) average density (Note 2)		X		X (Note 3)	
Automatic Sprinklers: 40-ft^2 coverage, 7-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.60-gpm/ft^2 (25-l/min/m^2) average density (Note 2)					X (Note 3)
Side Wall Automatic Sprinklers (not over 7-ft spacing)	X (Note 4)	X (Note 4)	X (Notes 3,5)		
Side Wall Automatic Sprinklers (not over 5-ft spacing)				X (Notes 3, 5)	X (Notes 3, 5)

NOTES

1. Adapted from Factory Mutual Loss Prevention Data Sheets.
2. For chambers under 2000 ft^2 (186 m^2) of floor area, the average density is for all heads. For chambers over 2000 ft^2, average density is for 3/4 of the sprinklers.
3. Sprinklers are located 1/3 the length of the pyramid from its base.
4. Required for walls over 15 ft (5 m) high and installed at approximately 15-ft vertical intervals.
5. Intermediate row required for walls over 15 ft high.

8.11.3.3 General Safeguards

8.11.3.3.1 No open flame equipment shall be allowed.

a. All equipment shall have covers in place.

8.11.3.3.2 All equipment with fans shall have shields and screens installed to ensure free flow of inlet and outlet air.

a. No exposed electrical terminals of any kind shall be permitted on any equipment.

8.11.3.3.3 Commonly used metal halide lamps shall be acceptable, but incandescent lights shall be vented to prevent heat buildup.

Verify the correct revision before use by checking the LMS Web site.

8.11.3.3.4 The power density of any equipment operated in the chamber shall not exceed 1 watt per square inch incident upon the liner material.

a. Where higher power densities are needed, the foam shall be laboratory tested for resistance to smoldering

b. Appropriate operating conditions shall be established.

8.11.3.3.5 Prior to use of any electrical equipment in the chamber (including flexible wiring or exposed power supply terminals), the difference between the chamber ground and equipment chassis shall not exceed 0.5 volt.

8.11.3.3.6 Wiring in the chamber shall be repaired only by qualified personnel.

8.11.3.3.7 Fire extinguishers type and capacity shall be provided near the chamber door.

8.11.3.3.8 If the control room is unoccupied the following shall be met if there is no suppression detection system in the chamber.

a. No equipment shall be left operating in the chamber while the control room is unattended.

b. At the close of business each day, all exterior doors to the chamber shall be closed.

c. At the close of business each day, main power to the chamber shall be secured.

8.11.3.3.9 Flammable or combustible liquids shall not be permitted inside the chamber unless approved by the LaRC Fire Chief.

8.11.3.3.10 Welding equipment, smoking, or open flames shall not be allowed in the chamber.

a. A sign placed near each entrance shall outline restrictions affecting fire safety.

8.11.3.3.11 High-intensity flood lamps shall be used only with the approval of the LaRC Fire Chief.

8.11.3.3.12 Fire protection equipment shall be inspected and maintained as recommended in Section 5.6 of this document.

a. Particular attention shall be given to the following:

(1) The system activating devices shall be checked to see that they are functional.

(2) The protection equipment shall be arranged so that it can be adequately tested every 6 months by simulating emergency mode conditions.

(3) All equipment requiring servicing and testing shall be readily accessible and provided with a practical means for adequate cleaning.

(4) Where protection systems use telescoping assemblies, they shall be moved through their full travel distance annually.

8.11.3.3.13 All employees having access to the chamber shall receive basic instruction in the general operation of the protection system, including the adverse consequences of using manual pulls or abort switches.

Verify the correct revision before use by checking the LMS Web site.

8.11.3.3.14 Chamber operators shall establish a salvage plan as part of their overall property conservation preparedness.

8.11.3.3.15 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in National Fire Protection Association (NFPA) 101.

8.11.4 RESPONSIBILITIES

8.11.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed.

8.11.4.2 LaRC AHJ shall evaluate anechoic chambers in accordance with this section.

8.11.4.3 COD shall ensure that all new anechoic chamber facilities or modifications to existing facilities meet the requirements of this section.

8.12 FIRE PROTECTION FOR TEMPORARY ENCLOSURES AND MEMBRANE STRUCTURES

8.12.1 PURPOSE

8.12.1.1 This section establishes the requirements for the installation and use of temporary enclosures and membrane structures at LaRC.

8.12.2 SCOPE

8.12.2.1 This section shall apply to all temporary and rigid frame membrane enclosures at LaRC and includes requirements and personnel responsibilities for fire protection.

a. The scope of this section also shall require compliance with the applicable sections of National Fire Protection Association (NFPA) 241.

8.12.3 REQUIREMENTS

8.12.3.1 Temporary enclosures erected within or around a facility shall not be structurally supported by piping arrangements designed for automatic sprinkler systems and other fire protection equipment.

8.12.3.2 Temporary enclosures shall be provided with adequate temporary fire protection systems and/or portable fire extinguishers, as approved by the LaRC Fire Chief.

a. Fire protection systems installed in temporary enclosures shall comply with the applicable NFPA standards.
b. Temporary enclosures shall require LaRC Fire Department inspections in accordance with Section 10.7 of this document.

Verify the correct revision before use by checking the LMS Web site.

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

a. Wood materials purchased for use in safety related areas at LaRC shall be designated as fire retardant, pressure-treated lumber suitable for exterior use.
b. All wood materials shall comply with the requirements for flame spread of 25 or less, with no evidence of significant progressive combustion when tested for a 30-minute period under the standard test method for fire hazard classification of building materials (ASTM E 84) and with no increase in the listed classification when subjected to the UL standard rain test (ASTM D 2898).
c. Each piece of wood shall permanently bear the mark of an accredited testing agency.
   (1) Alternate markings shall be acceptable, if approved by the LaRC AHJ.
d. The purchase of lumber not meeting the requirements specified above shall be approved by the LaRC AHJ.
e. The end use, location to be used, and justification for not using fire retardant, pressure-treated lumber shall be presented to the LaRC AHJ for review and approval before purchase of the lumber.
f. Exemptions shall be granted by exception rather than by rule.

8.12.3.4 All plastic films and fabrics for general use shall be of the flame retardant type meeting or exceeding the flame resistant requirements of NFPA 701.

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

a. The material specified for the shell of a membrane structure shall meet the requirements of the ASTM E 84-89a (maximum flame spread 25/maximum smoke development 450).
b. The material specified for the shell of a membrane structure shall be submitted to a third-party, independent testing laboratory for evaluation
c. The test results shall be submitted to the LaRC AHJ for review and authority.
d. The material specified for the shell of a membrane structure shall be tested and evaluated, in accordance with Chapter 14 of NFPA 701, which outlines accelerated dry cleaning, laundering, and water leaching test protocols to determine the adequacy of fire retardant and ultraviolet protection to hold up over a period of time when exposed to weather.

8.12.3.6 The use of temporary equipment or structures shall not exceed 6 months.

a. Temporary equipment or structures shall not exceed 1 year.
b. Temporary equipment or structures may be permitted one 6-month extension.
c. Temporary equipment or structures in use or remaining at the Center for over one year shall be considered permanent.
d. Temporary equipment or structures shall meet all applicable requirements of said equipment or structure.

Verify the correct revision before use by checking the LMS Web site.

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

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

8.12.3.8 Temporary enclosures and areas within 10 feet of the perimeter of the enclosures shall be posted as "No Smoking" areas.

8.12.3.9 All construction/operation electrical wiring and equipment for light, heat, or power supplies shall be in accordance with the applicable sections of NFPA 70.

8.12.3.10 Flammable and/or combustible liquids shall be kept to an absolute minimum.

a. Flammable and/or combustible liquids shall be stored in and dispensed from UL listed or FM approved safety cans.

b. Flammable and/or combustible liquid-soaked clothes, rags, or waste shall be stored in UL listed or FM approved safety containers.

8.12.3.11 Combustible materials which are used in the enclosure operations (e.g., rags, paper products) shall be removed from the enclosure immediately after use, or

a. Combustible materials which are used in the enclosure operations shall be stored in approved metal containers with lids in place

b. All combustible waste shall be removed from the enclosure after each work shift.

8.12.3.12 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101 and 29 CFR 1926.

8.12.3.13 Cutting, welding, open flame, or grinding shall not be performed in enclosures without an approved permit in accordance with Section 7.3 of this document.

8.12.3.14 Access for use of heavy firefighting equipment shall be provided to the temporary enclosure or job site at the start of the project and maintained until completion.

8.12.4 RESPONSIBILITIES

8.12.4.1 Facility Coordinator and/or Facility Safety Head or LaRC Engineering shall ensure that practices delineated in this section are followed and contact the LaRC AHJ prior to establishing new temporary enclosures.

812.4.2 LaRC AHJ shall evaluate locations requested to be used as a temporary enclosure.

8.12.4.3 When situations occur that in the judgment of the AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section.

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8.13 FIRE PROTECTION FOR VITAL RECORDS STORAGE

8.13.1 PURPOSE

8.13.1.1 This section establishes the requirements for the construction and use of new record storage facilities and those undergoing significant renovation, including record vaults, file rooms, archives, and records centers at LaRC. This section does not consider requirements that may be part of a security program needed to prohibit forcible entry.

8.13.2 SCOPE

8.13.2.1 This section shall apply to the collection of records in record storage facilities at LaRC.

8.13.3 REQUIREMENTS

8.13.3.1 Construction

8.13.3.1.1 Record storage facilities shall be constructed in accordance with the applicable sections of National Fire Protection Association (NFPA) 232.

a. Record storage vaults and file rooms exceeding 50,000 cubic feet and all archives and records centers shall be in accordance with NFPA 232AM.

8.13.3.1.2 Record storage facilities which store vital and important records shall be located in noncombustible facilities protected with automatic sprinklers.

a. Areas that provide storage of vital and important records shall be equipped with smoke detection systems.

8.13.3.2 Operation

8.13.3.2.1 Vital and important records (as defined by NFPA 232) shall be protected against fire.

8.13.3.2.2 Records that can be reproduced shall be duplicated and stored away from the originals so they will not be subject to the same fire incident.

8.13.3.2.3 Appropriate fire extinguishers shall be provided for record storage facilities.

8.13.3.2.4 Good housekeeping, orderliness, and maintenance of equipment shall be provided for record storage facilities.

8.13.3.2.5 Record storage facilities shall be posted as “No Smoking” areas.

8.13.3.2.6 Record storage facilities shall not be used as working spaces.

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8.13.3.2.7 Unauthorized persons shall not be permitted in record storage facilities.

8.13.3.2.8 Combustible materials which are used in the record storage facility operations (e.g., files, films, paper products) shall be removed from the record storage facility immediately after use or transported and stored in approved metal containers with lids.

a. All combustible waste shall be removed from the record storage facility after each work shift.

8.13.3.2.9 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

8.13.3.2.10 Cutting, welding, open flame, or grinding shall not be performed in record storage facilities without an approved permit in accordance with Section 7.3 of this document.

8.14 FIRE PROTECTION FOR OVENS, FURNACES, AND ENVIRONMENTAL CHAMBERS

8.14.1 PURPOSE

8.14.1.1 This section establishes the fire protection requirements for the installation and use of ovens, furnaces, and environmental chambers at LaRC.

8.14.2 SCOPE

8.14.2.1 This section shall apply to the design, operation requirements, and personnel responsibilities for ovens, furnaces, and environmental chambers creating fire protection issues at LaRC.

8.14.3 REQUIREMENTS

8.14.3.1 Design

8.14.3.1.1 Before new equipment is installed or existing equipment is modified, complete plans, sequence of operations, and specifications shall be submitted to the LaRC AHJ for approval.

a. Plans shall be drawn and show all essential details as to location, construction, ventilation, piping, and electrical safety equipment.
b. A list of all combustion control and safety equipment, including manufacturer and type/model number, shall be included.
c. Wiring diagrams and sequence of operations for all safety control shall be provided.
d. All wiring in and around ovens, furnaces, and environmental chambers shall be in accordance with National Fire Protection Association (NFPA) 70.

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8.14.3.1.2 Ovens, furnaces, and environmental chambers shall be located with consideration given to the possibility of fire resulting from overheating, quench tanks, ignition of hydraulic oil, overheating of material in the equipment, or the escape of fuel and to the possibility of facility damage and personal injury resulting from an explosion.

a. Ovens, furnaces, and environmental chambers shall be located and erected so that the facility structural members will not be adversely affected by the maximum anticipated temperatures.

8.14.3.1.3 Ovens, furnaces, and environmental chambers that may contain flammable liquids, vapors, or gases shall be equipped with an unobstructed relief vent for freely relieving internal explosions.

8.14.3.1.4 Emergency shutoff valves shall be provided to permit turning off fuel in an emergency and are located so that fires and explosions in the ovens, furnaces, and environmental chambers will not prevent access to these valves.

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

8.14.3.1.6 Ovens, furnaces, and environmental chambers containing or processing sufficient combustible materials to sustain a fire shall be equipped with automatic sprinklers, as required by the LaRC AHJ.

a. When oven, furnace, or environmental chamber temperatures are over 465°F or when a flash fire condition may exist, an open sprinkler system, supplied by an approved deluge valve equipped with a hand-pull for manual operation and controlled by heat-actuated devices, may be recommended within the equipment.

8.14.3.2 Operation

8.14.3.2.1 Operational and maintenance procedures shall be developed for each oven, furnace, and environmental chamber and include:

a. Entry requirements.
b. Maintenance checklist.
c. Cleaning requirements.
d. Combustible loading and usage limits.

8.14.3.2.3 Portable fire extinguishers shall be provided for the appropriate hazards.

8.14.3.2.4 Accumulation of combustible materials such as cartons, papers, and packaging materials shall be prohibited in and around ovens, furnaces, and environmental chambers.

8.14.3.2.5 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

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8.14.3.2.6 When situations occur that in the judgment of the AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section.

a. This may include the use of clean fire suppression agent such as FM-200 or early detection systems such as VESDA

8.14.4 RESPONSIBILITIES

8.14.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed and contact the LaRC AHJ prior to installation of new ovens, furnaces, and environmental chambers or modification of existing ovens, furnaces, and environmental chambers.

8.14.4.2 LaRC AHJ shall:

a. Evaluate locations requested for the installation of ovens, furnaces, and environmental chambers and modifications to existing ovens, furnaces, and environmental chambers.
b. Verify that SFAB Head and required SPE have reviewed the installation before signing approval

8.14.4.3 COD shall ensure that the design requirements delineated in this section are followed.

8.14.4.4 Operators/Employees shall follow the operational requirements delineated in this section.

8.15 FIRE PROTECTION FOR HEPA FILTER SYSTEMS

8.15.1 PURPOSE

8.15.1.1 This section establishes the requirements for the installation and use of high-efficiency particulate air (HEPA) filters and equipment at LaRC.

8.15.2 SCOPE

8.15.2.1 This section shall apply to the installation and use of new permanent HEPA filters and equipment at LaRC as well as change outs made to permanent systems. These requirements do not apply to portable HEPA filtration systems used on a temporary basis.

8.15.3 REQUIREMENTS

8.15.3.1 Atmosphere Filtration

8.15.3.1.1 Air and inert gas shall enter each ventilated area through at least one fire resistant HEPA filter

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8.15.3.1.2 Air and inert gas shall be discharged through at least one fire resistant prefilter and one fire resistant HEPA filter to exhaust ductwork leading to a final filter system.

8.15.3.2 Ventilation System Fire Protection

8.15.3.2.1 The ventilation system shall be designed to withstand any credible fire or explosion.

a. The ventilation system shall continue to act as a confinement barrier.
b. Fire protection features of ventilation systems shall include fire resistant materials of construction, fire resistant filters, heat and smoke detectors, alarms, heat removal devices, fire suppression equipment, and fire doors and dampers or other proven devices to restrict the spread of fires.

8.15.3.2.2 Design of the system shall include an analysis to determine if the ventilation system is capable of operating under design basis fire conditions as specified in the design criteria.

a. HEPA filtration systems serving as a final means of effluent cleaning shall have at least two stages of fire resistant filters in series in a filter plenum.
b. If it can be determined that the filters can be subjected to sufficient heat to cause failure, the final filters shall be protected by heat removal or sprinkler systems that automatically activate at a preset temperature.
c. If a heat removal system is deemed necessary, an inlet baffle and a spark arrestor and demister shall precede the first stage of filters.
d. If a cooling spray is used for heat removal, it shall be followed by a combination spark arrester/demister screen to remove entrained droplets.
e. A roughing filter shall be mounted behind these components to remove the bulk of the draft-carried debris.

8.15.3.2.3 The cooling spray system shall operate automatically upon abnormal temperature increase indicated by detectors in the exhaust ducts feeding the cool chamber inlet.

a. A manually operated valve actuating the spray system also shall be provided as a backup.

8.15.3.3 Instrumentation

8.15.3.3.1 Ventilation systems shall be provided with instrumentation to read out and alarm in one or more central control areas.

a. These areas shall be designed to permit occupancy and the ability to operate ventilation systems safely during normal and abnormal conditions.
b. The instrumentation system shall provide the following:
    (1) Readout from appropriate surveillance instrumentation for all essential functions of the ventilation systems.
    (2) Visual and/or audible alarms for significant abnormal conditions, such as filter plugging or breakthrough, low airflow or reversal, fire protection system activation, high stack and effluent activity.
    (3) For normal or abnormal conditions, where combustible solvents, gases, and vapors could possibly be present in a ventilation system, continuous monitoring systems

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suitable for monitoring such substances shall be included in the design, with readout normally in the control room.

(4) The ventilation system shall be designed with flow rates or other features to preclude the possibility of an explosion, as evaluated in the safety analysis document.

(5) All HEPA filters shall be equipped with differential pressure instrumentation.

8.15.4 RESPONSIBILITIES

8.15.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed and contact the LaRC AHJ prior to installation of new filter and plenum equipment or modification of existing filter and plenum equipment.

8.15.4.2 When situations occur that in the judgment of the AHJ, conventional prescriptive code requirements are not appropriate for a particular case, the AHJ shall be empowered to fashion an alternative solution that affords a reasonable level of safety to personnel and property and meet the spirit of this section. This may include the use of clean fire suppression agent such as FM-200 or early detection systems such as VESDA.

8.16 FIRE PROTECTION FOR HAZARDOUS MATERIALS STORAGE

8.16.1 PURPOSE

8.16.1.1 This section establishes the requirements for the storage, handling, and use of hazardous materials at LaRC. Hazardous materials are defined by Section F-2303 of the BOCA National Fire Prevention code and can include flammable and combustible liquids, gases, corrosives, oxidizers, water reactive chemicals, and radioactive materials.

8.16.2 SCOPE

8.16.2.1 This section shall apply to the handling and storage of hazardous materials at LaRC.

8.16.3 REQUIREMENTS

8.16.3.1 Design

8.16.3.1.1 Hazardous material storage shall be separated by minimum distances from other facilities and personnel areas in accordance with the appropriate standard.

a. Incompatible hazardous materials stored outside of facilities shall be separated from one another by minimum distances as specified in the appropriate standard.

b. Hazardous materials that may cause environmental damage in the event of fire shall be located in separate hazardous material containment buildings or tanks.

8.16.3.1.2 Hazardous material storage areas and buildings shall be provided with containment for liquid runoff control.

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8.16.3.1.3 Hazardous material storage buildings and aboveground tanks shall be provided with appropriate fire protection.

8.16.3.1.4 Separate hazardous material containment buildings shall be provided with fire sprinkler systems or other approved fire protection control and extinguishing systems.

8.16.3.2 Operation

8.16.3.2.1 Incompatible hazardous materials in the same facility shall be separated by suitable fire rated construction.

> *Note: A material that is incompatible with another is a material that can cause hazardous reactions or can promote or initiate combustion with the material. Examples of materials that require separation from one another are flammable/combustible liquids, corrosive materials, oxidizers, and water reactives.*

8.16.3.2.2 Hazardous materials shall be stored in appropriate containers.

8.16.3.2.3 Accumulation of combustible materials such as cartons, papers, and packaging materials shall be prohibited in and around hazardous material storage.

8.16.3.2.4 Weeds, rubbish, or similar combustibles shall not be permitted within 15 feet of hazardous material storage areas.

8.16.3.2.5 Portable fire extinguishers in hazardous storage buildings shall be provided for the hazard.

8.16.3.2.6 Personnel involved in hazardous material operations shall receive instructions in handling the materials in a safe manner.

8.16.3.2.7 Smoking shall not be permitted in or near hazardous materials storage areas.

8.16.3.2.8 Hazardous materials storage facilities shall not be used as dispensing facilities.

8.16.3.2.9 All spills shall be responded to and controlled per LPR 8715.12 LaRC Integrated Spill Contingency Plan

8.16.4 RESPONSIBILITIES

8.16.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed

a. Facility Coordinator and /or Facility Safety Head shall contact the LaRC AHJ prior to establishing new hazardous materials storage facilities.

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8.16.4.2 LaRC AHJ shall evaluate locations requested to be used as hazardous materials storage facilities.

8.16.4.3 COD shall ensure that the design requirements delineated in this section are followed.

8.16.4.4 Operators/employees shall follow the operational requirements delineated in this section and as set forth in their safety plan or permit.
a. The safety permit shall be issued by PHM Committee

8.17 FIRE PROTECTION FOR LABORATORY FACILITIES

8.17.1 PURPOSE

8.17.1.1 This section establishes the requirements for the installation and use of laboratory facilities at LaRC.

8.17.2 SCOPE

8.17.2.1 This section shall apply to all laboratories at LaRC.

8.17.3 REQUIREMENTS

8.17.3.1 Construction

8.17.3.1.1 All laboratories shall meet the minimum constructions requirements specified in the local building code and National Fire Protection Association (NFPA) 45.

8.17.3.1.2 All laboratories shall be provided with the appropriate fire protection features in accordance with NFPA 45.

8.17.3.1.3 Pressure relief systems shall discharge to a safe location.

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

8.17.3.1.5 Operating controls for apparatus shall be accessible under normal and emergency conditions.

8.17.3.1.6 Entrances to laboratory units or areas shall be identified with signs to warn emergency personnel of unusual or severe hazards.

8.17.3.1.7 Fire Extinguisher training shall be required for all chemical labs at LaRC

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8.17.3.2 Operation

8.17.3.2.1 The quantity of hazardous chemicals stored in the open in a laboratory work area shall be limited to the amount required for each specific task being performed
a. The quantity shall comply with NFPA 45.

8.17.3.2.2 Incompatible materials shall be segregated to prevent accidental contact with one another.

8.17.3.2.3 Containers of materials that may become hazardous over time shall be dated.

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

8.17.3.2.5 All spills shall be reported and cleaned up per LPR 8715.12 LaRC Integrated Spill Contingency Plan.

8.17.3.2.6 Hazardous operations as defined in the LPR 1710.12 Potentially Hazardous Materials shall have a PHM permit. The PHM Committee issues permits and reviews safety plans

8.17.4 RESPONSIBILITIES

8.17.4.1 Facility Coordinator and/or Facility Safety Head shall ensure that practices delineated in this section are followed and contact the LaRC AHJ prior to establishing new laboratories or modifying existing laboratories.

8.17.4.2 LaRC AHJ shall evaluate locations requested to be used as laboratories and modifications to existing laboratories.

8.17.4.3 COD shall ensure that the design requirements delineated in this section are followed.

8.18 FIRE PROTECTION FOR VACANT FACILITIES

8.18.1 PURPOSE

8.18.1.1 This section establishes the requirements for protecting vacant facilities at LaRC from fire and other related perils.

8.18.2 SCOPE

8.18.2.1 This section shall apply to all vacant and abandoned facilities at LaRC.

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8.18.3 REQUIREMENTS

8.18.3.1 Vacant facilities are high-risk target properties that require specialized fire protection solutions:

> *Note: If left totally unsupervised, vacant facilities often are used for inappropriate activities, such as storage, leading to either accidental or intentional ignition. If the exterior of the facility and the adjacent grounds are allowed to deteriorate, the probability of fire is increased.*

8.18.3.2 Vacant facility shall be managed and protected in accordance with the appropriate provisions of FM Data Sheet 9-17.

8.18.3.3 Upon vacating or abandoning a facility or property, the occupant shall remove combustible and hazardous materials to the extent specified by the NASA AHJ in order to achieve an acceptable level of safety.

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

8.18.3.5 Vacant facilities shall be maintained to be securely locked or barricaded to prevent entry by unauthorized persons.

8.18.3.6 Required sprinkler and standpipe systems and all component parts shall be maintained in an operable condition at all times.

a. Exception: Where the type of construction, fire separation and security of the structure does not create a fire hazard as approved by the LaRC AHJ.

8.18.3.7 If maintaining sufficient facility heat to avoid freezing is impractical, the automatic sprinkler system shall be arranged for cold weather operation in accordance with FM Data Sheet 2-8N.

a. If the interruption of heat is likely to be long-term or permanent, wet pipe systems may be fully converted to dry pipe systems.

8.18.3.8 Fire alarm systems shall be maintained in operable conditions at all times.

8.18.3.9 The required minimum clear width of exits, aisles, and passageways to a public way shall not be used for storage

8.18.3.10 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in National Fire Protection Association (NFPA) 101.

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8.18.4 RESPONSIBILITIES

8.18.4.1 Facility Coordinator and/or Facility Safety Head for Facility or Property Vacated shall ensure that practices delineated in this section are followed.

8.18.4.2 LaRC AHJ shall evaluate vacant facilities in accordance with this section.

8.18.4.3 COD shall ensure that vacant, closed and abandon facilities meet Center policies.

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CHAPTER 9

9. ASSESSMENT AND ANALYSIS

9.1 FIRE PROTECTION ENGINEERING SURVEY PROGRAM

9.1.1 PURPOSE

9.1.1.1 This section identifies the requirements for the fire protection engineering (FPE) survey program.

9.1.2 SCOPE

9.1.2.1 The requirements of this section shall apply to the performance of FPE surveys at LaRC.

9.1.3 REQUIREMENTS

9.1.3.1 FPE surveys shall be performed on LaRC facilities with the following priority, and based upon the Fire Protection Engineering (FPE) resources available.

a. FPE surveys shall be conducted for facilities (plus equipment) valued at $50 million or more, or where a significant safety hazard or vital programs are involved.
b. Facilities valued at less than $500,000 shall not require FPE surveys unless significant programmatic impacts, hazardous materials, or some other type of specialized hazard is involved.

9.1.3.2 The facility FPE surveys shall address, as a minimum, the following items as they relate to fire protection:

a. General description of construction
b. Fire protection
c. Fire protection water supplies
d. Occupancy
e. Life safety
f. Special hazards
g. Exposures
h. Property loss potential
i. Programmatic loss potential
j. Fire department
k. Approved deviations and waivers for facility
l. Violations and recommendations

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9.1.3.3 The FPE surveys shall consist of a standardized report covering the topics identified in above.
a. The complete written report shall be issued the first time a survey is performed. Follow-up reports only need to contain a summary of the survey report, unless significant changes have occurred to the facility.
b. If significant changes have occurred, then the total report shall be issued.

9.1.3.4 The engineer performing the survey shall conduct an opening meeting with the Facility Coordinator and/or Facility Safety Head to discuss the purpose of the review.

9.1.3.5 The finalized report shall be forwarded to the LaRC AHJ for distribution.
a. The LaRC AHJ shall ensure all findings are in the database.

9.2 FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY DATABASE

9.2.1 PURPOSE

9.2.1.1 This section establishes the process and requirements for the tracking of corrective actions relative to fire protection deficiencies resulting from fire protection engineering surveys.

9.2.2 SCOPE

9.2.2.1 This section applies to all fire protection findings resulting from fire protection engineering surveys at LaRC.

9.2.3 REQUIREMENTS

9.2.3.1 Surveys shall be conducted by a Fire Protection Engineer or the LaRC AHJ.

9.2.3.2 The LaRC AHJ shall ensure that survey deficiencies and related information are entered on the existing database.
a. Information to be entered shall include FPR Number, Violation Number, Facility Number, Year, Violation Description, Type of Violation, Recommendation, Status of Violation and Date, and Status of Description:

9.2.3.3 An example of the printout from the FPE Survey Deficiency Database is in Appendix C.

9.2.3.4 The LaRC AHJ or designee shall validate the closure of fire protection related findings.

9.2.3.5 The LaRC AHJ shall ensure that the appropriate information is entered on the tracking system to close the finding.

9.2.3.6 The LaRC AHJ or designee shall maintain all documentation relative to corrected fire protection related findings.

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9.2.3.7 The Facility Coordinator/Facility Safety Head shall notify the LaRC AHJ when the corrective action is completed.

9.3 FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY RANKING SYSTEM

9.3.1 PURPOSE

9.3.1.1 This section establishes a system for assessing the relative risk associated with each fire protection engineering (FPE) survey deficiency and for determining the priority of abatement activities. In addition, it establishes the requirements for interim compensatory measures based on the deficiency ranking.

9.3.2 SCOPE

9.3.2.1. This process shall apply to all deficiencies noted during fire protection engineering surveys and to the interim compensatory measures used as alternative protection to meet the intent of code requirements when final resolution of a deficiency is significantly delayed because of funding, scheduling, or other considerations.

9.3.3 REQUIREMENTS

9.3.3.1. Deficiency Ranking System

9.3.3.1.1 The FPE survey shall be the basis for assigning the fire protection rating for each deficiency by determining the severity of the injury or damage that could result from the hazard and the probability that an injury or damage could occur.

> *Note: Considerable fire protection engineering judgment is necessary to appropriately assess the severity and probability of a specific fire event as well as the impact of related perils.*

9.3.3.1.2 The classification of the severity of a hazard shall be based on the severity of the injury or damage that could result from the hazard.

a. This classification shall constitute the first step in determining the risk associated with the hazard.

9.3.3.1.3 The most serious type of injury or damage that is reasonably predictable as a result of the type of accident of fire shall be used in determining the fire protection rating.

9.3.3.1.4 The probability shall be directly related to the likelihood that a hazard will result in an injury or property damage based on an assessment of applicable safety factors.

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9.3.3.1.5 The assessor shall identify and evaluate as many relevant factors that may influence the likelihood that an injury or property damage will occur as possible.

a. The assessor shall assign them a weight in accordance with the relative contribution of each.

9.3.3.1.6 The following safety factors shall be considered when evaluating hazards:

a. Number of personnel or type of facility potentially exposed both concurrently and sequentially.
b. Frequency and duration of hazard exposure, including the full range of possible frequency/duration, from one-time, short exposures to once-per-week exposures to continuous daily exposure.
c. Personnel/property proximity to the hazard (e.g., from a location at the fringe of the danger zone up to the point of danger).
d. Working conditions that may increase the likelihood of an accident and the existence of appropriate and effective protective equipment.

9.3.3.1.7 The assessor shall also consider mitigating factors to the hazardous condition, such as the existence of specific instructions, effective training programs, warning signs and labels, and specific procedures which would provide some protection.

9.3.3.1.8 The assessor shall also consider contributing factors specific to the hazardous condition—such as inappropriate or inadequate instructions, inadequate or no training, and widespread hazardous conditions or faulty equipment— with little or no attempt to control them.

9.3.3.1.9 The Fire Protection Rating (FPR) assigned to each hazard is an expression of risk which combines its severity and probability. Using the matrix shown in Figure 3.1, the FPR shall:

a. Be expressed as a single code.
b. Relate directly to a risk category that can be used as a tool to determine priorities among hazard abatement activities.

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FPR	Major Category Rating Criteria	Subcategory Descriptive Criteria
	Priority Category	**Fire Protection**
V	Nonserious Technical Deficiency	Minor code noncompliance or deviation from a best management practice or recommended guide Permanent deviation or wavier may be on file or need to be sought for these deficiencies
IV	Code Noncompliance (Less Serious)	Technical deficiency, but much less serious in nature than FPR II or III High-dollar value loss or loss of life not likely to occur Fire potential and probability low
III	Code Noncompliance (Moderate)	Deficiency not as serious in nature as FPR II, but warrants some level of priority correction Fire potential moderate
II	Code Noncompliance (Serious)	Major deficiency, major code violations but not imminent in nature Serious life safety deficiencies Major fire protection system problems Lack of required suppression Large loss property damage potential high
I	Imminent	Death or serious injury to personnel very likely to occur Large loss property damage very likely Unacceptable fire loss potential Fire potential high Fire probability high

Figure 9.1, Fire Protection Rating Schedule.

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9.3.3.2 Interim Compensatory Measures

9.3.3.2.1 Interim compensatory measures shall be used to abate a hazard when the FPR is determined to be unacceptable if left unattended.

9.3.3.2.2 Interim compensatory measures (e.g., fire watches, fire patrols, enhanced hazard control procedures, temporary fire protection features) shall be specified under the following conditions:

a. A fire protection system is impaired, either planned or unplanned.
b. A temporary fire protection and life safety deviation or waiver from NASA directives or other mandatory codes and standards has been requested or granted.
c. Final resolution of a fire protection/life safety deficiency is significantly delayed because of funding, scheduling, or other considerations.
d. The measures specified are based on sound FPE judgment and recommended fire protection practices resulting from fire risk and loss potential assessment of the particular situation. Factors to be considered when assessing the fire risk and loss potential include the process/system involved, the location of the hazard, the impact on the program continuity, and similar items.

9.3.4 RESPONSIBILITIES

9.3.4.1 LaRC AHJ shall:

a. Rank each FPE survey deficiency to determine the overall risk rating.
b. Specify interim compensatory measures to be implemented as a result of a requested or granted fire protection deviation/waiver, or when justified by the hazard.

9.3.4.2 SFAB Head shall specify interim compensatory measures in the absence of the LaRC AHJ.

9.4 FIRE PROTECTION PROGRAM REPORT

9.4.1 The Fire Protection Program is reviewed monthly with the SMAO Director as required in the AOA.

9.5 FIRE HAZARD ANALYSIS PROGRAM

9.5.1 PURPOSE

9.5.1.1 This section provides the requirements for a fire hazard analysis (FHA).

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9.5.2 SCOPE

9.5.2.1 The requirements of this section shall apply to the performance of an FHA at LaRC. An FHA is only required if it is requested by SFAB Head, SMAO head or the AHJ.

a. If the FHA is requested, it shall comply with the requirements within this section.

9.5.3 REQUIREMENTS

9.5.3.1 Facilities Requiring an FHA

9.5.3.1.1 New facilities, existing high-value facilities, or facilities with significant fire protection issues or concerns generated in the fire protection engineering surveys shall have an FHA prepared.

9.5.3.2 Facility Safety Analysis Report

9.5.3.2.1 Each facility required to have a safety analysis report shall include or reference an FHA as part of that report.

a. The FHA shall be documented (including all assumptions).

9.5.3.3 Competent Individual

9.5.3.3.1 All FHAs shall be performed under the direction of, or are approved by, a Fire Protection Engineer.

9.5.3.4 Minimum Contents

a. FHAs, as a minimum, shall address the following items:
   (1) Description of construction.
   (2) Safety class systems.
   (3) Fire protection features.
   (4) Description of fire hazards.
   (5) Life safety considerations.
   (6) Critical process equipment.
   (7) High-value property.
   (8) Damage potential: maximum credible fire loss (MCFL) and maximum possible fire loss (MPFL).
   (9) Fire department/brigade response.
   (10) Recovery potential.
   (11) Potential for a toxic, biological, and/or radiological incident due to a fire.
   (12) Emergency planning.
   (13) Security and safeguards considerations related to fire protection.
   (14) Natural hazards (earthquake, flood, wind) impact on fire safety.
   (15) Exposure fire potentials.

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9.5.3.5 Single Failure Criteria for FHAs

9.5.3.5.1 Each FHA shall assume that one installed, automatic fire protection system will malfunction.

9.5.3.5.2 If redundant automatic fire protection systems are provided in the area, only the system whose failure would cause the most vulnerable condition shall be assumed to fail.

9.5.3.5.3 Passive fire protection features (such as blank fire rated walls or continuous fire rated cable wraps) shall be assumed to remain viable.

9.5.3.6 Selecting the Analysis Boundary

9.5.3.6.1 The focus of the FHA shall be the individual fire areas that comprise the facility.

a. The boundaries of exterior fire areas (yard areas) shall be as determined by the program secretarial officer or delegated authority.
b. Where a facility is not subdivided by fire rated construction, the fire area shall be defined by the exterior walls and roof of the facility.

9.5.3.7 Effect of Fire on Vulnerable Safety Class Systems

9.5.3.7.1 An essential element of an acceptable FHA shall be an inventory of all safety class systems within the fire area that are susceptible to fire damage.

a. This shall include those primary and supporting mechanical and electrical systems that function effectively during and after a fire event to assure safety (including safe shutdown, where applicable).
b. Such safety class systems shall include, but are not limited to, process monitoring instrumentation, instrument air, facility hydraulic system, and emergency lighting system.

9.5.3.7.2 For example, loss of the facility ventilation system in a fire (due to damage to power cables) may result in an ambient air temperature increase which may cause the failure of sensitive electrical safety class components such as relays.

9.5.3.8 Credible Failure Modes for Safety Class Systems

9.5.3.8.1 All credible fire related failure modes of safety class systems shall be considered.

9.5.3.8.2 For example, it is insufficient to assume that fire will merely cause the loss of function of safety class equipment when power cables to that equipment are within the fire area. It is also necessary to consider the potential for spurious signals which may cause the maloperation of such equipment. Similarly, fire induced electrical faults may trip upstream electrical disconnect devices in such a way as to render inoperable other safety class systems that may not even be located within the fire area. In addition, the effects of combustion

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products, manual firefighting efforts, and the activation of automatic fire suppression systems shall be assessed.

9.5.3.9 Ventilation System Operation and Failures

9.5.3.9.1 Fire propagation and the potential for fire induced material dispersal through the facility air distribution system shall be considered for the normal operating mode of the air distribution system as well as alternate modes that may result from the fire, such as shutdown.

9.5.3.10 Computer Models

9.5.3.10.1 An acceptable tool that shall be used to aid in the development of an FHA is a fire model (such as FPETOOL, FAST, or HARVARD) as applied by fire protection engineers and approved by the authority having jurisdiction (AHJ).

9.5.3.11 Simplifying Assumptions

9.5.3.11.1 Where appropriate, as a simplification to the analysis, an assumption shall be permitted that all potentially vulnerable systems will be damaged within the fire area.

a. Acceptable exceptions to this assumption shall be water filled steel pipes, tanks, and similar components of superior structural integrity with welded fittings and adequate pressure relief.

9.5.3.12 Combustible Material

9.5.3.12.1 The quantity and associated hazards of flammable and combustible materials that can be expected to be found within the fire area shall be factored into the analysis. Consideration should also be given to the presence of transient combustibles associated with storage and maintenance activities.

a. Averaging combustible loading over the floor or fire area as a means to characterize the fire severity shall <u>not</u> be considered an acceptable technique.

9.5.3.13 Special Considerations for High-Bay Facilities and Areas

9.5.3.13.1 FHAs for high-bay locations shall consider the effects of smoke/hot gas stratification that may occur at some intermediate point below the roof or ceiling.

a. The effect of smoke movement through doors and dampers held open by fusible links shall be addressed.

9.5.4 RESPONSIBILITIES

9.5.4.1 The LaRC AHJ shall be responsible for ensuring that FHAs are performed per this LPR when required.

Verify the correct revision before use by checking the LMS Web site.

9.6 FIRE PROTECTION PROGRAM REVIEW/SELF-ASSESSMENT

9.6.1 PURPOSE

9.6.1.1 This section identifies the requirements for the review and self-assessment of the fire protection program.

9.6.2 SCOPE

9.6.2.1 The requirements of this section shall apply to the performance of the LaRC fire protection program review and self-assessment.

9.6.3 REQUIREMENTS

9.6.3.1 LaRC shall conduct periodic reviews of the fire protection program elements and performs a self-assessment of the fire protection program effectiveness to ensure compliance with the NASA fire protection goals and requirements. This audit can be met through the IFO audit or an OSHA VPP audit or a monthly AOA Business Review.

9.6.3.2 The fire protection program self-assessment reports shall be part of the audit report presented IFO, AOA, or VPP audit report.

9.6.4 RESPONSIBILITIES

9.6.4.1 The LaRC AHJ shall be responsible for ensuring that fire protection program self-assessments are conducted.

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CHAPTER 10

10. FIRE DEPARTMENT OPERATIONS AND EMERGENCY RESPONSE

10.1 FIRE DEPARTMENT EMERGENCY EQUIPMENT

10.1.1 PURPOSE

10.1.1.1 This section provides specific requirements for LaRC Fire Department and emergency equipment, to ensure that it will meet the needs required by LaRC.

10.1.2 SCOPE

10.1.2.1 This section shall apply to LaRC Fire Department, emergency equipment used for fire fighting, specialized rescue, hazardous materials, emergency medical, and other types of emergency response.

10.1.3 REQUIREMENTS

10.1.3.1 Procurement of Fire Department Emergency Equipment

10.1.3.1.1 LaRC Fire Chief shall:

a. Ensure that emergency response equipment meets the minimum specifications of the applicable referenced National Fire Protection Association (NFPA) standards.
b. Prepare the necessary procurement documentation according to the LaRC criteria pertaining to the procurement of equipment.

10.1.3.2 Use of Fire Department Emergency Equipment

10.1.3.2.1 Fire Department Station Officer shall:

a. Develop the internal operating procedures to ensure that emergency equipment is used for its intended purpose.
b. Maintain emergency equipment according to the manufacturer's recommendations and the applicable referenced NFPA standards.
c. Ensure that emergency equipment which does not meet the minimum specifications or is unsafe for use is removed from service and replaced with compliant equipment.

10.1.3.3 Responsibilities

10.1.3.3.1 LaRC Fire Department Station Officer, in conjunction with the LaRC Fire Chief shall develop the internal operating procedures in accordance with this section and ensure the proper use, maintenance, and care of LaRC Fire Department emergency equipment.

10.1.3.3.2 LaRC Fire Department Personnel shall report unsafe emergency equipment to the LaRC Fire Department station officer.

Verify the correct revision before use by checking the LMS Web site.

10.2 FIRE DEPARTMENT PERSONAL PROTECTIVE EQUIPMENT

10.2.1 PURPOSE

10.2.1.1 This section provides specific requirements for the purchase and care of personal protective equipment used for emergency operations.

10.2.2 SCOPE

10.2.2.1 This section shall apply to personal protective equipment used for fire fighting, rescue, hazardous materials, emergency medical, and other LaRC Fire Department emergency responses.

10.2.3 REQUIREMENTS

10.2.3.1 Procurement of Personal Protective Equipment

10.2.3.1.1 LaRC Fire Chief shall:

a. Ensure the development of the internal operations procedures to ensure that personal protective equipment meets the minimum specifications of the applicable referenced National Fire Protection Association (NFPA) standards.
b. Prepare the necessary procurement documentation according to the LaRC criteria pertaining to the procurement of equipment.

10.2.3.2 Use of Personal Protective Equipment

10.2.3.2.1 LaRC Fire Chief shall ensure the development of internal operating procedures to make sure that personal protective equipment is utilized for its intended purpose.

10.2.3.2.2 LaRC Fire Department Station Officer shall:

a. Ensure that personal protective equipment is maintained according to the manufacturer's recommendations and the applicable referenced NFPA standards.
b. Ensure that the personal protective equipment which does not meet the minimum specifications is removed from service and replaced with compliant equipment.

10.2.4 RESPONSIBILITIES

10.2.4.1 LaRC Fire Chief shall:

10.2.4.2 Ensure personal protective equipment is in accordance with NFPA and City of Hampton SOPs. LaRC Fire Department Station Officer shall:

a. Develop the internal operating procedures in conjunction with the LaRC Fire Chief in accordance with this section.
b. Ensure the proper use, maintenance, and care of personal protective equipment.

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10.3 FIRE FIGHTING FORCES

10.3.1 PURPOSE

10.3.1.1 This section provides specific requirements for establishing the manual fire fighting forces for the fire protection of LaRC and outlines supplemental forces and support units to assist the LaRC fire companies when needed.

10.3.2 SCOPE

10.3.2.1 This section shall apply to the LaRC fire fighting forces, whether career or volunteer.

10.3.3 REQUIREMENTS

10.3.3.1 Fire Fighting/Fire Department Staffing

10.3.3.1.1 Staffing shall be arranged so that a crew with a minimum of six fire fighters is maintained on duty at all times.

10.3.3.1.2 Staffing shall be arranged so that responses to NASA facilities on the West side of the Center are responded to within 4 minutes. (Currently, LaRC Fire and Emergency Services maintains **4-minute averaged response time** from initial receipt of the 9-1-1 call for emergency service. Response times relate directly to the level of service provided by a fire/rescue department. Two elements that rapid response time can influence are fire flashover and medical injuries.

a. **FIRES/FIRE RESCUES:** The initial period need for fires to build to intolerable temperatures is around 4 minutes (dependent upon fire loads and fire fuels present). From 4 minutes to 8 minutes of duration, fire temperatures can triple to over 1,200 degrees. This can create a phenomenon known as flashover. One of the keys to rapid fire intervention, rescue, minimization of damage to the structure, and optimal safety to firefighting personnel is to arrive quickly and prevent the fire from rapidly increasing in its intensity and damage potential.

b. **MEDICAL RESPONSES:** A minimal response time of 4 minutes or less has a direct correlation to successful intervention and quality of life in emergency medical situations. The advancement of emergency medicine in the early 1970's was due to the recognition of the importance of rapid medical intervention. In cases where application of CPR is required, the 4-minute time line is critical in the chain of survival of a patient. Brain tissue, which is not capable of regeneration, begins to die after 4 minutes without oxygen, so the longer a patient goes without being resuscitated; the more the quality of life may be significantly affected even if they are eventually revived.

10.3.3.2 Training of Fire Department Personnel

10.3.3.2.1 Continuing education of personnel shall be coordinated between the Hampton Fire Department training officer, station officers, and LaRC Fire Chief.

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10.3.3.2.2 Fire fighting personnel shall have completed Hazardous Materials and Hazardous Waste Operations and Emergency Response (HAZWOPER) training.

10.3.3.3 Fire Department Personnel

10.3.3.3.1 Fire Department Personnel shall:

a. Fight fires in accordance with established procedures. (By City of Hampton's SOPs)
b. Maintain equipment and fire station in accordance with established procedures.
c. Inspect vehicles and operating areas.
d. Render basic and advanced life support in emergencies.
e. Perform other duties as deemed necessary by the Fire Department station officer.

10.3.4 RESPONSIBILITIES

10.3.4.1 LaRC Fire Chief shall:

a. Ensure that LaRC Fire Department personnel are trained to meet all fire emergencies.
b. Ensure that any assigned volunteer personnel are trained to a level equal to career staff typically assigned. Volunteers shall meet the full City of Hampton background check as approved by NASA OSS.

10.3.4.2 Hampton Fire Department will coordinate the training of fire fighting forces.

10.3.4.3 LaRC Fire Fighting Personnel shall perform the tasks delineated in this section.

10.3.4.4 LaRC Fire Department Station Officer shall assist in the implementation of training activities on his or her shift.

10.3.4.5 Command Structure and fire ground activity shall be conducted per NASA/City of Hampton Agreement.

10.4 FIRE SUPPRESSION

10.4.1 PURPOSE

10.4.1.1 This section defines the actions to be taken in the event of fires or other related perils to reduce exposure to personnel and to prevent damage to facilities and equipment from the products of combustion.

10.4.1.2 Actions are taken to prevent the spread of fire(s) originating outside the boundaries of LaRC from encroaching onto government property.

10.4.1.3 Precautions are taken to prevent the spread of fire(s) from government property onto private, state, or corporate property.

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10.4.1.4 Measures are implemented to prevent the on-site or off-site release of hazardous materials from fires and other related perils.

10.4.1.5 Specific precautions are taken to prevent products of combustion within production, assembly, warehouse, and mission-essential facilities.

10.4.1.6 Response to fires and emergency shall be performed in accordance with the NASA City of Hampton Reciprocal Fire Agreement SAA1 -876

10.4.2 SCOPE

10.4.2.1 This section shall be implemented when conditions are such that personnel, facilities, equipment, systems, or materials are jeopardized or at risk from fire within the boundaries of LaRC.

10.4.3 REQUIREMENTS

10.4.3.1 General

10.4.3.1.1 In the best interest of the government, the LaRC Fire Chief and Fire Department station officer shall implement the appropriate section(s) of this standard to protect life, property, materials, supplies, or equipment from fires.

a. Fire protection of LaRC is of the utmost importance and shall not be jeopardized or compromised.

10.4.3.2 Fire Response

10.4.3.2.1 LaRC EDO shall:

a. The EDO shall dispatch LaRC Fire Department officer and fire suppression equipment with the proper staffing to prevent the spread of fire to areas that contain personnel, property, or equipment.
b. The EDO shall dispatch any required assists or person(s) needed to mitigate an emergency as requested by NASA Security SOPs or as requested by the Incident Commander
c. The EDO shall Notify the LaRC Fire Chief of any fire or medical event accruing at LaRC

10.4.3.2.2 LaRC Fire Chief or Fire Department Station Officer shall:

a. Notify the applicable personnel or organizations to supply equipment that is to be used during suppression operations. Designates a staging area where equipment and personnel are to report.
b. Request that the mutual aid agreements be placed into effect, as appropriate.
c. Advise the Facility Coordinator and/or Facility Safety Head of existing and potential conditions and that this procedure may need to be implemented.
d. Together with the City of Hampton, ensure the minimum response time for west side's emergency is less than four minutes during a 30 day period.

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10.4.3.2.3 Facility Coordinator and/or Facility Safety Head shall ensure that preparations are made to complete the tasks as requested by the LaRC Fire Department station officer.

10.4.3.3 Post Fire Response

10.4.3.3.1 LaRC Fire Department Station Officer shall:

a. Ensure that notifications are made to the appropriate persons: Facility Coordinator and/or Facility Safety Head; Duty officer; and LaRC Fire Chief.
b. Ensure that all equipment that was placed out of service is returned to normal or automatic position.

10.4.4 RESPONSIBILITIES

10.4.4.1 LaRC Fire Chief or Fire Department Station Officer shall:

a. Maintain, implement, and enforce guidelines in this section.
b. Use all available manpower and equipment to prevent the spread of fire(s) from or onto government-owned property.
c. Request fire suppression assistance according to the mutual aid agreement.

10.4.4.2 LaRC EDO shall:

a. Make appropriate announcements.
b. Inform the Facility Coordinator and/or Facility Safety Head of the shutdowns.
c. Notify the LaRC Fire Chief as directed by the LaRC Fire Department Station Officer.
d. Make the mutual aid requests as directed by the LaRC Fire Chief, LaRC Fire Department Station Officer, or incident commander (IC).
e. By using the EARS system, disable or re-enable fire systems as required by the IC, SFAB Head, or the LaRC Fire Chief
f. Contact any NASA personnel, NASA contactor, or persons that the LaRC Fire Chief, SFAB Head, or IC needs to mitigate an emergency or hazard.

10.4.4.3 Facility Coordinator and/or Facility Safety Head shall:

a. Take actions to secure/safeguard/protect operations and equipment when informed by the LaRC Fire Chief or LaRC Fire Department Station Officer.
b. Inform his or her managers and supervisors when the provisions of this section are placed into effect.
c. Maintain an up-to-date listing of disabled occupants and their locations.
d. Maintain an up-to-date listing of hazardous materials and their locations.

10.5 FIRE DEPARTMENT TRAINING

10.5.1 PURPOSE

10.5.1.1 This section provides specific requirements for development and implementation of LaRC Fire Department training.

Verify the correct revision before use by checking the LMS Web site.

10.5.2 SCOPE

10.5.2.1 This section shall apply to the development and implementation of training for the LaRC Fire Department personnel who serve LaRC.

10.5.3 REQUIREMENTS

10.5.3.1 Development of Fire Department Training

10.5.3.1.1 Hampton Fire Department and/or LaRC Fire Chief shall:

a. Develop training which covers each facet of emergency response:
   (1) Fire fighting
   (2) Emergency medical response
   (3) Hazardous materials response
   (4) Rescue
b. Develop training for routine operations and skills according to the referenced National Fire Protection Association (NFPA) standards pertaining to professional fire fighter competencies.
c. Ensure that training meets or exceeds the minimum requirements established in the applicable referenced NFPA standards and Virginia Office of Fire Programs

10.5.3.2 Implementation of Fire Department Training

10.5.3.2.1 Hampton Fire Department shall:

a. Establish an annual training schedule for the LaRC Fire Department Fire Chief. Note: NASA may fund and organize Center specific or other specialized training.
b. Schedule and conduct training classes according to the referenced NFPA standard pertaining to the specific training course.
c. Ensure that all LaRC Fire Department training courses are conducted under the supervision of qualified instructors and that each participant attains the established minimum Competency level.
d. Ensure that all live training evolutions are conducted according to the NFPA standard governing such training and are constantly under the supervision of the Hampton Fire Department safety officer.
e. Maintain LaRC Fire Department training records for each course.
f. Provide the LaRC Fire Chief with up-to-date training records for the personnel.

10.5.3.2.2 LaRC Fire Department Personnel shall:

a. Attend the scheduled fire department training sessions.
b. Maintain the minimum Competency level according to the referenced NFPA standard pertaining to professional fire fighter qualifications.
c. Conduct operations according to established training courses governing the specific operations.

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10.5.3.2.3 Hampton Fire Department Safety Officer will ensure that all training courses are conducted according to established procedures and immediately terminate a training evolution when an unacceptable condition is detected.

10.5.4 RESPONSIBILITIES

10.5.4.1 LaRC Fire Department Personnel shall develop operating procedures and implement LaRC Fire Department operating procedures.

10.5.4.2 Hampton Fire Department shall schedule and conduct LaRC Fire Department operations procedure training.

10.5.4.3 Hampton Fire Department Safety Officer shall maintain minimum safety standards for all LaRC Fire Department training.

10.6 FIRE DEPARTMENT MUTUAL AID AGREEMENTS

10.6.1 PURPOSE

10.6.1.1 This section provides specific requirements for the establishment of fire department mutual aid agreements.

10.6.2 SCOPE

10.6.2.1 This section shall apply to all fire department mutual aid agreements.

10.6.3 RESPONSIBILITIES

10.6.3.1 LaRC Director shall

a. Ensure that an active mutual aid agreement has been signed with the surrounding fire departments.
b. Ensure that the LaRC Fire Department is prepared and equipped to meet its obligation as specified in the mutual aid agreement.

10.6.3.2 LaRC AHJ shall ensure that the mutual aid agreement is up-to-date and implement the mutual aid agreement as necessary.

10.7 FIRE DEPARTMENT FACILITY INSPECTIONS

10.7.1 PURPOSE

10.7.1.1 This section establishes a program for inspecting and reporting unsafe conditions or acts pertaining to fire safety.

Verify the correct revision before use by checking the LMS Web site.

10.7.2 SCOPE

10.7.2.1 This section shall apply to all personnel and facilities at LaRC.

10.7.3 REQUIREMENTS

10.7.3.1 LaRC Fire Chief shall:

a. Ensure that facility inspections are conducted.
b. Ensure that routine facility inspections are conducted according to the referenced fire department procedures pertaining to facility inspections
c. Ensure that all deficiencies are tracked to resolution.

10.7.3.2. All inspections for NASA LaRC facilities shall be performed annually. AHJ has the authority to stop inspections or change inspection frequencies.

10.7.3.3 Facility Coordinator and/or Facility Safety Head shall:

a. Aid the fire department in conducting facility inspections as requested, including the following: Unlocking doors and providing special escorts.
b. Ensure timely correction of all noted unsafe conditions.
c. Ensure that the LaRC Fire Department has a complete up-to-date hazardous materials list.

10.7.3.4 LaRC Fire Department Personnel shall perform inspections and forward reports to the LaRC bonfire Chief for review and resolution through the ATS system.

10.7.4 RESPONSIBILITIES

10.7.4.1 LaRC Fire Chief shall establish a facility fire safety inspection program and implement the facility fire safety inspection program.

10.7.4.2 Facility Coordinator and/or Facility Safety Head shall support the facility fire safety program and address facility fire safety inspection findings.

10.7.4.3 LaRC Fire Department Personnel shall conduct fire safety inspections in accordance with the referenced documents.

10.8 EMERGENCY MEDICAL SERVICES

10.8.1 PURPOSE

10.8.1.1 This section establishes a program for emergency medical response at LaRC.

10.8.2 SCOPE

10.8.2.1 This section shall apply to emergency medical response at LaRC.

Verify the correct revision before use by checking the LMS Web site.

10.8.3 REQUIREMENTS

10.8.3.1 LaRC Fire Chief shall ensure that emergency medical responses are conducted by qualified personnel.

10.8.3.2 LaRC Fire Chief shall ensure that emergency medical responses are conducted according to the referenced fire department procedures.

10.8.3.3 LaRC Fire Department Station Officer shall ensure that medical responses are conducted according to the referenced fire department procedures.

10.8.3.4 LaRC Fire Department Station Office shall ensure timely correction of all noted unsafe conditions.

10.8.3.5 Medical units stationed at NASA LaRC shall meet the State requirements for transporting of an Advanced Life Support (ALS) injured person.

10.8.3.6 LaRC Fire Chief shall ensure the minimum response time for west side's Medical emergency is less than four minutes during a 30 day period

10.8.4 RESPONSIBILITIES

10.8.4.1 LaRC Fire Chief shall establish and implement an emergency medical response program.

10.9 FIRE DEPARTMENT PREPLANS

10.9.1 PURPOSE

10.9.1.1 This section establishes a program for the development and maintenance of emergency response preplans.

10.9.2 SCOPE

10.9.2.1 This section applies to the LaRC Fire Department emergency response preplans.

10.9.3 REQUIREMENTS

10.9.3.2.1 LaRC Fire Chief shall:
a. Ensure the establishment of a fire department preplan for each facility.
b. Ensure that fire department preplans are reviewed on a yearly for facilities bases.

10.9.3.2 Development of Fire Department Preplans

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10.9.3.2.1 LaRC Fire Department Station Officer shall:

a. Ensure that fire department preplans address the following items as a minimum:
   (1) Facility occupancy
   (2) Special hazards
   (3) Fire protection systems provided for the building
   (4) Location of fire hydrants
   (5) Location of fire department connections
   (6) Exposures
   (7) Special salvage requirements

b. Transmit the complete fire department preplan to the LaRC AHJ for review and approval.

10.9.3.2.3 Facility Coordinator and/or Facility Safety Head shall:

a. Provide facility specific support in the development of an accurate fire department preplan.

10.9.4 RESPONSIBILITIES

10.9.4.1 LaRC Fire Chief shall establish the schedule for the development of fire department preplans.

10.9.4.2 LaRC Fire Department Station Officer shall:

a. Develop the preplan as delineated in this section.

b. Work with the Facility Coordinator and/or Facility Safety Head to ensure the accuracy of the preplans.

10.9.4.3 Facility Coordinator and/or Facility Safety Head shall:

a. Provide facility specific input for the development of the fire department preplans.

10.10 FIRE DEPARTMENT HAZARDOUS MATERIAL RESPONSE PROGRAM

10.10.1 PURPOSE

10.10.1.1 This section establishes and implements a program that will provide the required information on hazardous materials at LaRC and reduce personnel exposures.

10.10.2 SCOPE

10.10.2.1 This section shall apply to all the members of the LaRC Fire Department and to other non-LaRC Fire Department emergency responders, as applicable.

Verify the correct revision before use by checking the LMS Web site.

10.10.3 REQUIREMENTS

10.10.3.1 Hampton Fire Department shall develop instructional objectives and learning outcomes to support educational activities designed to train fire service personnel to the National Fire Protection Association (NFPA) Hazardous Materials First Responder level.

a. Each objective is a statement of the skills and/or body of knowledge a person shall achieve to attain this level of competency.

10.10.3.3 Response personnel shall follow City of Hampton SOPs for Hazardous Material Response as well as LPR 8715.12 LaRC Integrated Spill Contingency Plan

10.10.4 RESPONSIBILITIES

10.10.4.1 Hampton Fire Department shall develop the Hazardous Materials First Responder Training Program and conduct hazardous materials training.

10.10.4.2 Fire fighter shall attend hazardous materials training and meet the minimum established First Responder proficiency level.

10.11 FIRE DEPARTMENT SALVAGE PLANS

10.11.1 PURPOSE

10.11.1.1 This section establishes responsibilities for the emergency salvage of essential equipment exposed to products of combustion or fire fighting agents.

10.11.2 SCOPE

10.11.2.1 This section shall apply to all LaRC operations having essential equipment and equipment with programmatic value or long-term replacement times.

a. For equipment that does not fall within the above criteria as stated in 10.11.2.1, this standard shall be followed to the extent practicable.

10.11.3 REQUIREMENTS

10.11.3.1 Emergency Salvage Equipment

10.11.3.1.1 Emergency salvage equipment required for essential electronic equipment differs for the various locations; however, equipment that shall be provided includes:

a. Waterproof salvage covers (used to protect equipment).
b. Squeegees.
c. Mops and buckets.

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10.11.3.2 Emergency Salvage Operations

10.11.3.2.1 LaRC Fire Chief shall ensure that preplans for salvage of essential equipment are developed and ensure salvage equipment is maintained.

> *Note: In the event of fire, particularly where there is considerable smoke or use of water, prompt salvage operations can greatly aid in the rapid restoration of operations and limitation of damage.*

10.11.3.2.2 LaRC Fire Fighting Forces shall perform prompt salvage and overhaul operations during

10.11.4 RESPONSIBILITIES

10.11.4.1 LaRC Fire Chief shall:

a. Ensure that the required salvage equipment is maintained.

b. Ensure the development of the salvage preplans and the performance of salvage operations.

Verify the correct revision before use by checking the LMS Web site.

Appendix A
DEFINITIONS

Aging - Large-scale deterioration over time, caused by service and the environment.

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

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

Assembly Point - An area identified by the facility owner and/or facility safety head with concurrence from the LaRC Authority Having Jurisdiction (AHJ) for facility personnel to safely gather following an evacuation.

Authority Having Jurisdiction (AHJ) - The individual responsible for approving equipment, an installation, or a procedure.

Building - Any structure, enclosure, facility, or ramp used or intended for supporting or sheltering any use or occupancy. The term “building” shall be construed as if followed by the words “or portions thereof.”

Certificate of Beneficial Occupancy - A document signed by the Safety and Facility Assurance Office (SFAB) Head attesting that an area or facility substantially complies with all fire protection and Life Safety Code requirements, but is not in literal compliance with all fire safety requirements.

Certificate of Final Occupancy - A document signed by the SFAB Head attesting that an area or facility fully complies with applicable Occupational, Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), NASA, and LaRC safety requirements on the date of the issuance of the certificate.

Clean Room - A room in which the concentration of airborne particles is controlled to specific limits.

Clean Zone - A defined space in which the concentration of airborne particles is controlled to specific limits.

Computer Area - An area of a facility where the computer room is located including support rooms served by the same special air conditioning/air handling equipment as the computer room.

Computer Room - A room within the computer area that contains the electronic computer/data processing equipment.

Construction Projects - New facilities, facility additions, and facility alterations.

Verify the correct revision before use by checking the LMS Web site.

Deviation - A variance that authorizes departure from a particular safety requirement where the intent of the requirement is being met through alternate means which provide an equal or greater level of safety.

Exit - That portion of a means of egress that is separated from all other spaces of the facility or structure by construction or equipment as required by referenced documents to provide a protected way of travel to the exit discharge.

Exit Access - That portion of a means of egress that leads to an exit.

Exit Discharge - That portion of a means of egress between the termination of an exit and the public way.

Facility Fire Watch - The monitoring of facility operations during fire protection system impairments and the monitoring of other compensatory measures.

Facility Owner and/or Facility Safety Head - The individual having either the responsibility for all facility related items or processes with the facility or the responsibility for the personnel working in the facility. The responsible manager is the facility owner in instances where the requirement or responsibility pertains to the actual facility or processes in the facility, such as when a light bulb needs to be replaced. The supervisor directly responsible for the employees performing operations or working in the facility is the responsible manager in instances where the requirement or responsibility pertains to the employees performing operations (e.g., when a requirement states that the responsible manager ensures that personnel conduct tasks in a specified manner). In many situations, the responsible manager is both the facility owner and the supervisor of personnel in the facility.

Fire Area - An area bounded by construction with a minimum fire resistance rating of 2 hours, unless otherwise approved by the AHJ, with openings protected by appropriately fire rated doors, dampers, or penetration seals. The boundaries of exterior fire areas (yard areas) are determined by the AHJ.

Fire Hazard Analysis - A comprehensive assessment of the risks from fire within individual fire areas in a facility.

Fire Loss - The dollar cost of restoring damaged property to its prefire 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 (such as damaged fire department equipment), and consequent effects on related areas in all property loss amounts.

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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 fire fighting operations (fire department), Fire Protection Engineer (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 phenomenon, and smoke and water damage from fire.

Fire Protection Engineering Survey - The process of reviewing, inspecting, testing, conducting surveillance, appraising and surveying to determine and document the compliance of facilities and operations with applicable directives, codes, and standards.

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 Review - A review of construction plans prior to contemplated construction for adequacy of fire risk appraisal and protection and for compliance with NASA fire protection criteria.

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 shutdown of a fire protection system or portion thereof.

Fire Watch (for hot work activities) - The individual(s) who monitor the area around hot work activities for any fires or hot spots caused by sparks or slag. The personnel assigned to this task have received hands-on fire extinguisher training, and the hands-on training is renewed biannually. The personnel performing this task typically are drawn from the organization performing the hot work or possibly the LaRC Fire Department in special hazard situations and with the approval of the LaRC Fire Chief.

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

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the facility is vital to operational continuity or may experience a large property loss from fire in the absence of an automatic extinguishing system.

Maximum Credible Fire Loss - The property damage that would be expected from a fire, assuming that (1) all installed fire protection systems function as designed; and (2) the effect of emergency response is omitted except for post fire actions such as salvage work, shutting down water systems, and restoring operations.

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.

Means of Egress - A continuous and unobstructed way of exit travel from any point in a facility or structure to a public way, consisting of three separate and distinct parts: the exit access, the exit, and the exit discharge.

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

Public Way - Any street, alley, or other similar parcel of land essentially open to the outside air that is dedicated or otherwise permanently appropriated to the general employee for Center use. The public way has clear width and height of not less than 10 feet.

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

Redundant Fire Protection - Fire protection measures implemented to mitigate the effects of fires or related perils in the event of a partial or total failure of the primary fire protection measures (e.g., two independent fire suppression systems to protect a high risk facility).

Safety Class - Equipment: A system or component that by not performing as intended could lead to loss of life, severe injury, or major property damage.

Safety Related Area - A system, equipment, or facility that, by not performing as intended, causes a hazardous condition that may lead to loss of life, severe injury, or major property damage.

Shop Welding Area - A permanently identified and fixed location in which hot work operations take place to support specific projects or facility operations.

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

Temporary - Not to exceed a period of six months.

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Transient Fire Load - 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, etc. This does not include hand carrier 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 - A variance that authorizes departure from a specific safety requirement where an increased level of risk has been accepted.

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

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

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Appendix B
ACRONYMS

ADA	American Disabilities Act
AFFF	Aqueous File Forming Foam
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ATS	Audit Tracking System
CDR	Critical Design Review
CFC	Chlorofluorocarbon
COD	Center Operations Directorate
COF	Construction of Facilities
EARS	Emergency Alarm Response System
EDO	Emergency Dispatch Office
FC	Facility Coordinator
FHA	Fire Hazard Analysis
FM	Factory Mutual
FPE	Fire Protection Engineer
FSH	Facility Safety Head
FPR	Fire Protection Rating
HEPA	High-efficiency Particulate Air Filtration
IC	Incident Commander
LaRC	Langley Research Center
LEL	Lower Explosive Level
LPG	Liquefied Petroleum Gas
LPR	Langley Procedural Requirements
MCFL	Maximum Credible Fire Load
MPFL	Maximum Possible Fire Load
NFPA	National Fire Protection Association
NPR	NASA Procedural Requirements
NRL	Naval Research Laboratory
OSHA	Occupational Safety and Health Administration
OSS	Office of Security Service
PDR	Preliminary Design Review
PHM	Potentially Hazardous Material
SFAB	Safety and Facility Assurance Branch
SMAO	Safety and Mission Assurance Office
SPE	Standard Practice Engineer
STD	Standard Technical Document
UL	Underwriters Laboratories

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Appendix C
SAMPLE FPE SURVEY DEFCICIENY DATABASE PRINTOUT

27Jul 96

FPR Number: **II**

Violation Number	**Facility Number:**	**Year:**	**Violation Number**
1244-95-V01	1244	1995	V01

Violation Description: **Type of Violation:** FSD

The existing water deluge system within the hangar does not provide satisfactory protection per Section 3-1.1 of NFPA 409; and Chapter 7, Section 700 of NASA STD 8719.11, Safety Standard for Fire Protection.

Recommendation(s):

Provide an approved foam water deluge system(s) and supplemental protection systems designed in accordance with NFPA 16 and NFPA 11 or 11A, respectively. Enhanced fire detection should be provided with this system upgrade and be designed and installed in accordance with NFPA 72.

Status of Violation: **Status Description:**

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Appendix D
FIRE PROTECTION IMPAIRMENT

1. 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 shall be promptly reported to the Emergency Dispatch Office (EDO) located at Facility1248 – NASA Fire Station by calling 864-5500. Information required shall include:

    a. Name of person reporting impairment
    b. Company, organization, or work group
    c. Telephone number
    d. Equipment impaired
    e. Equipment location (facility number, room or space number)
    f. Reason for impairment / outage
    g. Date / time equipment tagged out
    h. Anticipated date / time equipment to be placed back in service

2. EDO shall be promptly notified when equipment is restored back in service.

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