DOCUMENT INFORMATION		
Doc. No.	**Title**	**Organization**
1710.11	Fire Protection Program	SMAO

ACTION REQUEST	REVIEW PERIOD: Marcy 7-18, 2016
Action	**Summary of Changes**
☒ Revision/Review ☐ New Document	1. Five-year review. 2. Revised throughout to meet current standards.

Reviews are handled according to CP 1410.2, Langley Management System Document Control.
When commenting on drafts or revisions, please cite specific sections and page numbers when possible.

Subject: LaRC Fire Protection Program

Responsible Office: Safety Management

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PREFACE

P.1 ~~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~~requirements and responsibilities for Government personnel and contractors in performing their ~~responsibilities for this program~~jobs at LaRC.

P.2 ~~P.2~~ APPLICABILITY

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

P.3 ~~P.3~~ AUTHORITY

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

P.4 ~~P.4~~ APPLICABLE DOCUMENTS

a. ~~a.~~LPR 8715.12, "LaRC Integrated Spill Contingency Plan"

b. LPR 1710.10, "Safety Clearance Procedures"

c. LPR 1710.12, "Potentially Hazardous Materials"

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

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

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

~~e.~~f. ~~c.~~NASA STD 8719.7, "Facility System Safety Guidebook"

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

i.h. e. Fire Inspection and Code Enforcement Manual (FSTA).)

k.i. f. International Building Code (current edition)

m.j. g. International Mechanical Code (current edition)

o.k. h. International Plumbing Code (current edition)

q.l. i. International Fire Code (current edition)

s.m. j. OSHA 29 CFR Part 1910 Subpart L, Fire Protection

u.n. k. OSHA 29 CFR Part 1926 Subpart F, Fire Protection

w.o. l. Fire Protection Handbook (current edition)

y.p. m. Fire and Life Safety Inspection Manual (current edition)

aa.q. n. ASME A17.1, “Safety Code for Elevators and Escalators”

cc.r. o. NFPA 1, “Fire Code” (current edition)

ee.s. p. NFPA 70, “National Electrical Code” (current edition)

gg.t. q. NFPA 101, “Life Safety Code” (current edition)

ii.u. r. NFPA 72, “National Fire Alarm and Signaling Code” (current edition)

kk.v. s. NFPA 13:, “Standard for the Installation of Sprinkler Systems” (current edition)

~~mm.~~w. ~~t.~~ NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems" (current edition)

~~nn.~~x. ~~u.~~ NFPA 2001, "Standard on Clean Agent Fire Extinguishing Systems" (current edition)

~~oo.~~y. ~~v.~~ NFPA 17, "Standard for Dry Chemical Extinguishing Systems" (current edition)

~~qq.~~z. ~~w.~~ NFPA 17A, "Standard for Wet Chemical Extinguishing Systems" (current edition)

~~ss.~~aa. ~~x.~~ NFPA 20, "Standard for the Installation of Stationary Fire Pumps for Fire Protection" (current edition)

~~tt.~~bb.

~~uu.~~cc. ~~y.~~ NFPA 45, "Standard on Fire Protection for Laboratories using Chemicals" (current edition)

~~vv.~~dd. ~~z.~~ NFPA 96, "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations" (current edition)

~~ww.~~ee. ~~aa.~~ NFPA 10, "Standard for Portable Fire Extinguishers" (current edition)

~~yy.~~ff. ~~ab.~~ NFPA 14, "Standard for the Installation of Standpipe and Hose Systems" (current edition)

~~zz.~~gg. ~~ac.~~ NFPA 33, "Standard for Spray Application Using Flammable or Combustible Materials" (current edition)

~~aaa.~~hh. ~~ad.~~ NFPA 54, "National Fuel Gas Code" (current edition)

~~ccc.~~ii. ~~ae.~~ NFPA 55, "Compressed Gases and Cryogenic Fluids Code" (current edition)

~~eee.~~jj. ~~af.~~ NFPA 58, "Liquefied Petroleum Gas Code" (current edition)

~~ggg.~~kk. ~~ag.~~ NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems" (current edition)

~~hhh.~~ll. ~~ah,~~ NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work" (current edition)

~~iii.~~mm. ~~ai,~~ NFPA 80, "Standard for Fire Doors and Other Opening Protectives" (current edition)

~~jjj.~~nn. ~~aj,~~ NFPA 92, "Standard for Smoke Control Systems" (current edition)

~~lll.~~oo. ~~ak,~~ NFPA 96, "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations" (current edition)

~~mmm.~~pp. ~~al,~~ NFPA 101B, "Code for Means of Egress for Buildings and Structures" (current edition)

~~nnn.~~qq. ~~am,~~ NFPA 105, "Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives" (current edition)

~~ppp.~~rr. ~~an,~~ NFPA 110, "Standard for Emergency and Standby Power Systems" (current edition)

~~qqq.~~ss. ~~ao,~~ NFPA 170, "Standard for Fire Safety and Emergency Symbols" (current edition)

~~sss.~~tt. ~~ap,~~ NFPA 214, "Standard on Water-Cooling Towers" (current edition)

~~uuu.~~uu. ~~aq,~~ NFPA 220, "Standard on Types of Building Construction" (current edition)

~~www.~~vv. ~~ar,~~ NFPA 230, "Standard for the Fire Protection of Storage" (current edition)

~~yyy.~~ww. ~~as,~~ NFPA 291, "Recommended Practice for Fire Flow Testing and Marking of Hydrants" (current edition)

~~zzz.~~xx. ~~at,~~ NFPA 230, "Standard for the Fire Protection of Storage" (current edition)

~~bbbb.~~yy. ~~au,~~ NFPA 450, "Guide for Emergency Medical Services and Systems" (current edition)

~~dddd.~~zz. ~~av,~~ NFPA 471, "Recommended Practice for Responding to Hazardous Materials Incidents" (current edition)

~~eeee.~~aaa. ~~aw,~~ NFPA 13E, "Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems" (current edition)

~~ffff.~~bbb. ~~ax,~~ NFPA 750, "Standard on Water Mist Fire Protection Systems" (current edition)

~~hhhh.~~ccc. ~~ay,~~ NFPA 901, "Standard Classifications for Incidents Reporting and Fire Protection Data" (current edition)

~~iiii.~~ddd. ~~az,~~ NFPA 902, "Fire Reporting Field Incident Guide" (current edition)

~~kkkk.~~eee. ~~ba,~~ NFPA 904, "Incident Follow-up Report Guide" (current edition)

~~mmmm.~~fff. ~~bb,~~ NFPA 921, "Guide for Fire and Explosion Investigations" (current edition)

P.5 ~~P.5~~ MEASUREMENT/VERIFICATION

None

~~P.7~~P.6 ~~P.6.~~ CANCELLATION

LPR 1710.11 Dated July 6, 2010

~~*Original signed on file*~~

~~Stephen G. Jurczyk~~

_____
Deputy Director

DISTRIBUTION:
Approved for public release via the Langley Management System; distribution is unlimited.

1. INTRODUCTION

1.1 FOREWORD

~~Appendix~~

~~1.1.4~~1.1.1 ~~Table 5-1~~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, facilities, operations and the environment. The LaRC Fire Protection ~~support~~Group helps ensure that activities are conducted in compliance with fire, building and life safety laws, National Aeronautics and Space Administration (NASA) directives, regulations, general industry practices, and in a manner appropriate for the associated hazards.

~~1.1.5~~1.1.2 ~~1.1.2~~ The establishment of a comprehensive LaRC Fire Protection Program has as its goal to ensure that an ~~adequate~~acceptable level of fire ~~protection~~, building and life safety is maintained for all personnel and property. This LPR was developed in order to achieve this goal and maintain a viable and effective fire, building and life safety program. Authority for the development and implementation of the LaRC Fire Protection Program is rooted in NPD 8700.1~~A~~, "NASA Policy for Safety and Mission Success".

~~1.1.6~~1.1.3 ~~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.~~a. ~~NPR 8820.2C, "Design and Construction of Facilities"~~

c. ~~1.1.4~~ NPR 8820.C, "Design and Construction of Facilities"

~~1.1.7~~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~~1910OSHA Regulations
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~~National Fire Protection Association (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

~~1.1.8~~1.1.5~~1.1.5~~ NASA STD 8719.11 expands on the policy and guidelines for fire ~~protection~~, building and life safety listed in NPR 8715.3. NASA STD 8719.11 is a compilation of pertinent requirements from Occupational Safety and Health Administration (OSHA~~,~~), NFPA, as well as, unique NASA requirements. Compliance with this standard is mandatory for all NASA Field Installations. This Standard establishes ~~fire protection~~safety 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 ~~1.1.6~~ LaRC management is responsible for correcting work conditions and employee actions that may contribute to the occurrence of fire~~.~~ or other life threatening event. 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~~personnel fully comply with fire, building and life safety requirements ~~fully complying with LaRC directives.~~.

~~CHAPTER 2~~

~~3.~~2. ~~2.~~ PROGRAM MANAGEMENT

2.1 ~~2.1~~ FIRE PROTECTION STATEMENT

2.1.1 ~~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~~, building and ~~standards~~life safety criteria.

2.1.2 ~~2.1.2~~ SCOPE

~~2.1.2.1~~ This directive shall apply to the implementation of the ~~fire protection program in~~LaRC Fire Protection Program across all organizations ~~at LaRC and to all~~, contractors, activities and facilities at LaRC.

2.1.3 ~~2.1.3~~ REQUIREMENTS

~~SFAB/Fire &~~The Safety and Mission Assurance Office (SMAO) Fire and Emergency Preparedness Team shall develop, manage and implement the LaRC Fire Protection Program.

2.1.3.1 ~~2.1.3.1~~ The LaRC Fire Protection Program shall include the following elements: ~~management; administration; documentation; training;~~

a. Management
b. Administration
c. Documentation
d. Training
e. System and facility design ~~and~~, construction~~;~~, operation and maintenance
~~a.~~f. Fire protection engineering (FPE)
g. Fire prevention
h. Fire detection and annunciation
i. Fire/smoke confinement
~~b.~~j. Fire suppression
~~c.~~k. Fire department organization
l. Inspection ~~inspection, testing, and maintenance; and quality assurance.~~
m. Testing
n. Maintenance
o. Investigations
p. Code compliance, interpretation, application, equivalencies, rulings
q. Certificates of Occupancy
r. Emergency access

s. Hazards abatement

~~2.1.3.1~~2.1.3.2 The functional/organizational structure of the LaRC Fire Protection Program is shown in Figure 2.1.

~~2.1.3.2~~2.1.3.3 ~~2.1.3.2 The fire protection~~This Program shall provide and maintain a level of fire ~~protection~~ , building and life safety 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~~2.1.3.4 ~~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~~, building 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 team maintaining a database of FPE deficiencies, recommended corrections, and status of corrections, as well as ~~Safety's~~the SMAO Audit Tracking System (ATS~~)~~).

c. Appropriate review and correction of fire safety violations.

   1) This shall be accomplished by the participation in a formal fire protection design review process to facilitate fire ~~protection~~, building and life safety deficiency resolution in the earliest design phases. (Requirement Documents, preliminary design reviews, critical design reviews, table tops, and function approvals).

   2) This process shall aid in preventing vital programs or projects from suffering unacceptable delays and expense as a result ~~of fire or its perils~~of code-related deficiencies.

d. Submittal of Construction of Facilities (CoF) projects to correct ~~fire protection~~safety-related 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 the fire ~~protection~~and safety-related systems and equipment, as well as, a documented improvement system to follow.

g. Facility fire inspection and fire safety training. ~~SFAB/~~The Fire ~~&~~and Emergency Preparedness Group shall:

1) Conduct fire inspections of the LaRC facilities
2) ~~. SFAB/ Fire & Emergency Preparedness Group shall~~ Conduct training ~~to~~for LaRC employees~~,~~ on fire prevention programs for ~~the control of~~ housekeeping, combustible loading, hot work operations, hazardous materials, ~~and~~ fire extinguisher selection and use and the control of ignition sources such as smoking and portable heating devices.

~~g.~~h. Proper functioning of the ~~field installation~~LaRC Fire Department and/or coordinat~~ion~~e with the responsible local fire department~~s~~. The Fire Chief will maintain or enter into agreements with Hampton, Virginia and Joint Langley ~~Air Force~~-Eustis 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~~pre-fire planning, inspection services, and specialized fire safety training.

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

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

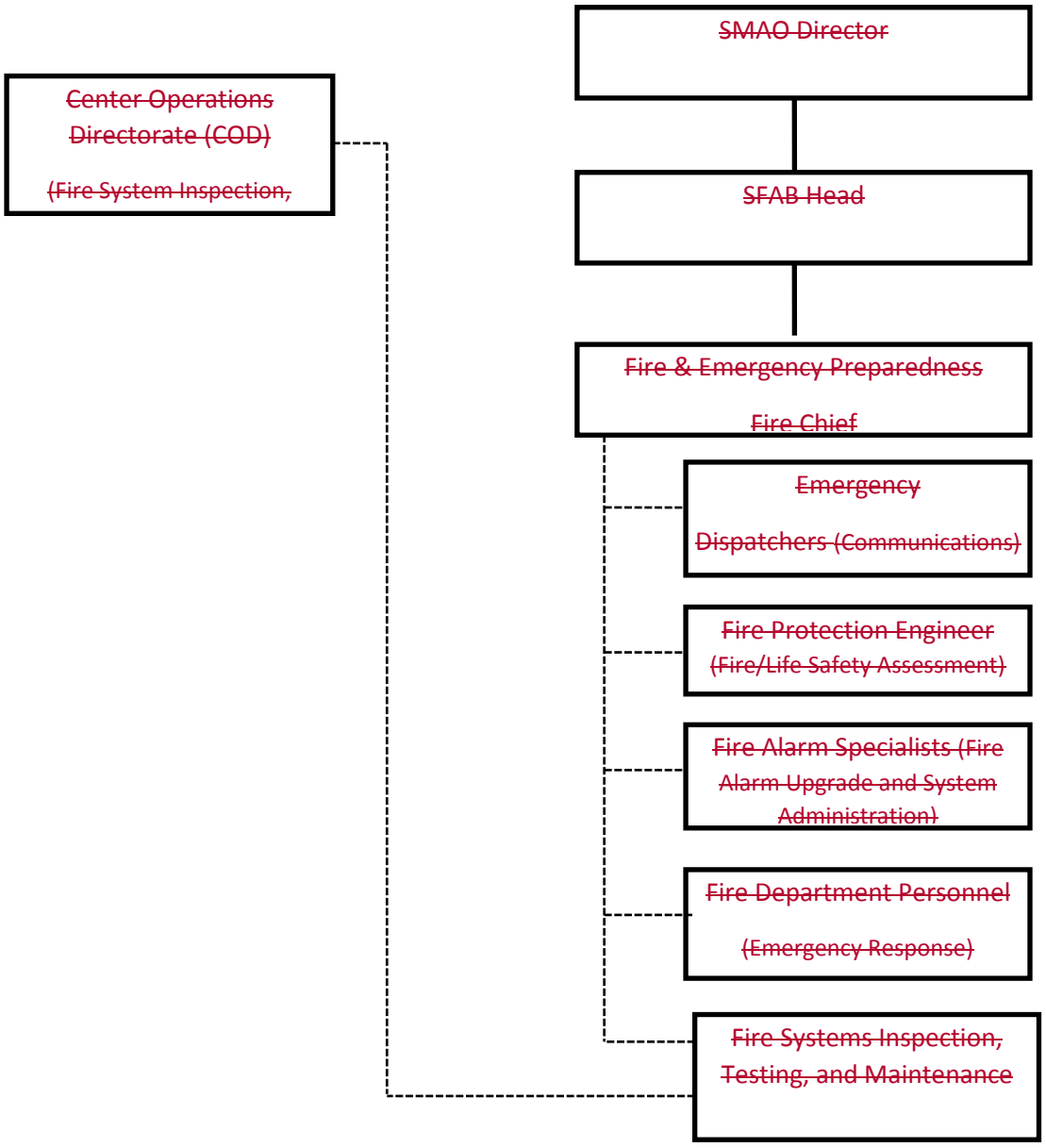
~~j.~~k. Designation of an ~~authority having jurisdiction (~~AHJ~~).~~. The responsibility of the AHJ is identified in Section 3.1.

~~k.~~l. Compliance with local, State, and Federal laws, ~~national~~International Building Codes, NFPA codes~~,~~ and standards and other criteria for fire ~~protection~~, building and life safety, 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.

~~l.~~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~~FHA, as warranted.

~~m.~~n. Review of facility design drawings for inclusion of adequate fire ~~protection~~, building and life safety features and systems and for compliance with applicable codes and criteria. This shall be accomplished by establishing requirements that provide an acceptable degree of life safety to facility personnel; protection of LaRC facilities and other assets, by providing a reliable water supply and water supply system (source, storage facilities, pumps, valves, and hydrants) of sufficient capa~~c~~bility for the maximum credible fire~~;~~ by developing and maintaining ~~Fire Hazard Analyses~~FHA's; and by providing automatic suppression and detection systems in all areas subject to serious property damage and/or program interruption.

~~n.~~o. Review of all contractual documents for fire ~~protection specifications.~~, building and life safety requirements. This shall be accomplished through an aggressive and documented ~~fire protection~~ design review process ~~and the requirement~~ to ~~have~~ensure compliance with applicable safety-related codes, standards, regulations, laws, best practices and to ensure that contractual documents are reviewed and approved by the ~~Safety and Mission Assurance Office (~~SMAO~~).~~.



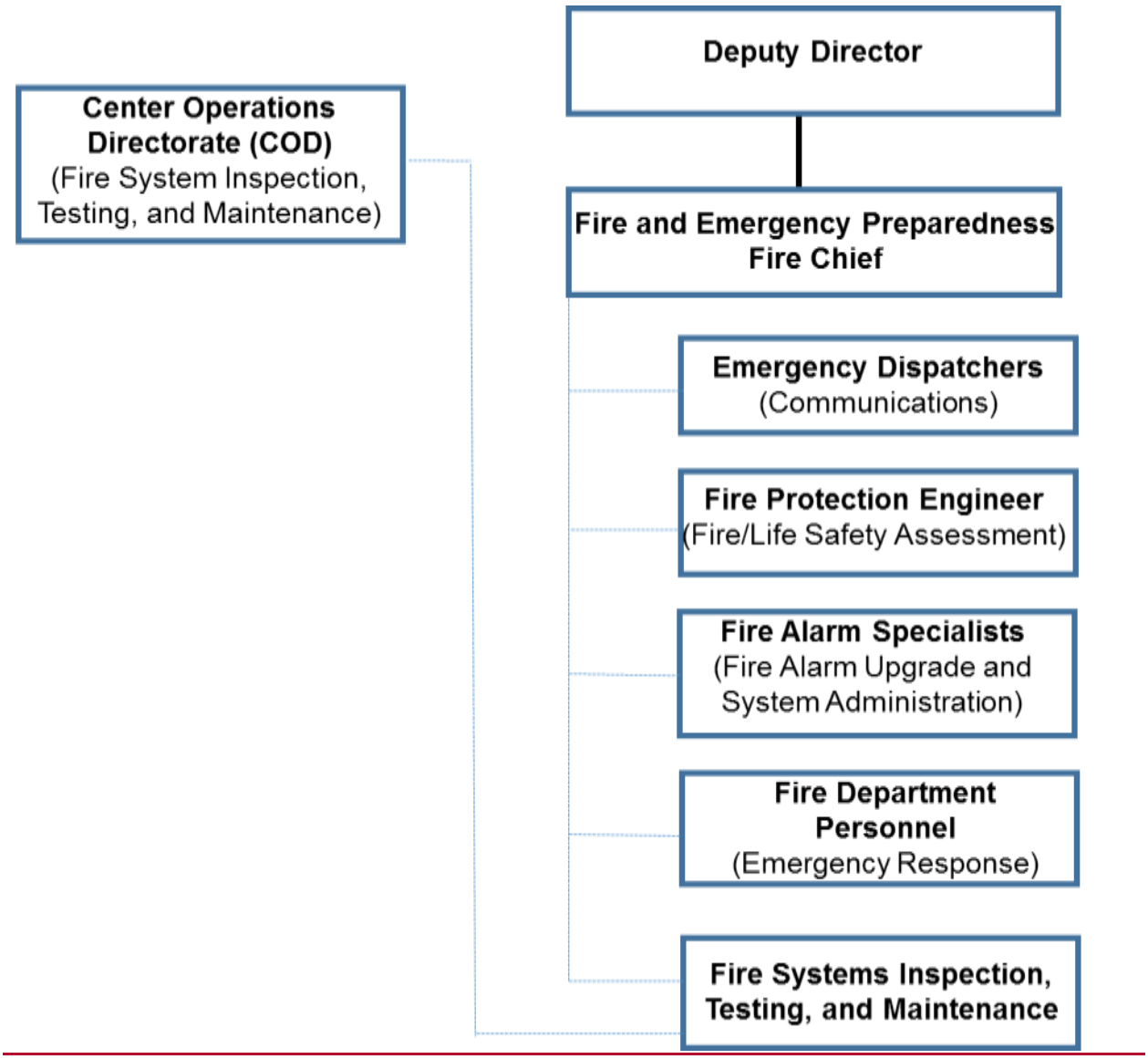


Figure 2.1, Functional/Organizational Structure of the LaRC Fire Protection Program.

2.1.4 ~~2.1.4~~ RESPONSIBILITIES

2.1.4.1 ~~2.1.4.1~~ The LaRC Fire Chief shall have the overall management responsibility for the LaRC Fire Protection Program.

2.1.4.2 ~~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~~to support the program.
~~. Plan, organize, direct and control the fire protection program.~~
~~e.~~d. Provide and maintain a strong, competent fire protection staff.
~~. Periodically assess the fire protection program.~~
~~g.~~e. ~~Work~~Serve as the Center's AHJ for fire ~~protection~~, building and life safety as per Section 3.1.

2.1.4.3 ~~2.1.4.3~~ Center Operations Directorate (COD) shall ~~have~~appoint the LaRC AHJ to be a voting member on ~~the~~ Preliminary Design Reviews (PDR) and the Critical Design Reviews (CDR~~)~~), the development of Requirements Documents, Engineering Feasibility Studies, and for the approval of designs for compliance with this LPR and its referenced documents.

2.1.4.4 ~~2.1.4.4~~ COD shall ~~have~~obtain the AHJ ~~sign~~signature on all construction drawings / specifications and ~~have~~include the AHJ ~~support~~ in the resolution of problems related to fire ~~protection.~~, building and life safety.

2.1.4.5 ~~2.1.4.5~~ All Associate Directors, ~~Organizational Unit Managers, and workers~~LaRC Center Director, and both Government and contractor workforce shall be directly responsible for the ~~fire~~ safety of all personnel and property within their respective areas of operation.

2.2 ~~2.2~~ FIRE PROTECTION ISSUES MANAGEMENT

2.2.1 ~~2.2.1~~ PURPOSE

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

2.2.2 ~~2.2.3~~ SCOPE

~~2.2.3.1~~ This Section shall apply to all fire ~~protection~~, building and life safety findings resulting from audits and surveys at LaRC.

2.2.3 ~~2.2.4~~ REQUIREMENTS

2.2.3.1 ~~2.2.4.1~~ Internal fire protection surveys ~~are~~shall be conducted under the direction of the LaRC AHJ.

~~2.2.3.1.3~~2.2.3.1.1 ~~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 (FC) and/or Facility Safety Head (FSH) for resolution of deficiencies.
b. Discuss with the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head,~~FSH potential corrective actions for identified deficiencies. Additionally, ensure that interim compensatory measures are in place as warranted.

2.2.3.1.2 ~~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~~:~~ that incorporates the following information:

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~~safe practices)
e. Fire protection ranking of violation
f. Violation description
g. Recommendation(s)/interim compensatory measures if warranted

~~2.2.3.1.4~~2.2.3.1.3 ~~2.2.4.1.3~~ The responsible ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall notify the LaRC Fire Chief when the corrective actions are completed.

~~2.2.3.1.5~~2.2.3.1.4 ~~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.

~~2.2.3.1.6~~2.2.3.1.5 ~~2.2.4.1.5~~ The LaRC AHJ ~~then~~ shall then close the deficiency in the database~~,~~.

~~2.2.3.1.7~~2.2.3.1.6 ~~2.2.4.1.6~~ The LaRC AHJ shall maintain documentation relative to all corrected fire ~~protection~~, building and life safety related findings ~~for surveys.~~.

~~2.2.3.1.8~~2.2.3.1.7 ~~2.2.4.1.7~~ Annual fire and life safety inspection ~~documentation~~activities and findings shall be documented and maintained in the ATS system.

2.2.3.2 ~~2.2.4.2~~ Annual inspections are conducted by the LaRC Fire Protection Team using the Audit Tracking System (ATS)

2.2.3.2.1 ~~2.2.4.2.1~~ LaRC Fire Protection Team shall:

.

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

~~2.2.3.2.3~~2.2.3.2.2 ~~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~~findings 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~~FC and/or ~~Facility Safety Head~~FSH.
c. Enter the deficiencies into the fire protection database for tracking purposes.
d. Validate closure of deficiencies when notified by the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH.

2.2.4 ~~2.2.5~~ RESPONSIBILITIES

2.2.4.1 ~~2.2.5.1~~ LaRC Fire Chief shall:
~~Issue~~

a. Establish 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~~FC and/or ~~facility safety head~~FSH.
c. Review ATS inspection report and ~~forwards the report~~forward to the respective ~~facility coordinator~~FC and/or ~~facility safety head~~FSH 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 inspections are performed in accordance with this Section.

2.2.4.2 ~~2.2.5.2~~ LaRC ~~AHJ~~Fire Chief 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.

2.2.4.3 ~~2.2.5.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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.~~ .
~~h.~~f. Aid with the deficiency resolution and performance of any other tasks assigned within this Section.

2.3 ~~2.3~~ FIRE ~~PROTECTION~~, BUILDING AND LIFE SAFETY FORMAL WAIVERS

2.3.1 ~~2.3.1~~ PURPOSE

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

2.3.2 ~~2.3.2~~ SCOPE

~~2.3.2.1~~ This Section shall apply to all organizations at LaRC which operate facilities or equipment that m~~a~~y warrant a formal waiver.

2.3.3 ~~2.3.3~~ REQUIREMENTS

2.3.3.1 ~~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 a performance-based approach as described in NFPA and NASA STD 8719.11 ~~through the LaRC AHJ~~, application for a formal waiver may be ~~requested.~~made to the LaRC AHJ.

2.3.3.2 ~~2.3.3.2~~ Any request for a formal waiver of requirements from this LPR, NASA Fire Protection Policy, ~~National~~nationally-recognized codes, and consensus standards 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~~, nationally-recognized codes, or standard shall be ~~approved by~~ made directly to the LaRC AHJ.

~~4.2.54.2.1~~ ~~2.3.4~~ Per STD 8719.11 the AHJ is the sole individual empowered to grant waivers of ~~RESPONSIBILITIES~~

~~2.3.3.7~~2.3.3.3 ~~2.3.4.1 All LaRC organizations requesting a formal waiver from a mandated~~ fire ~~protection code, standard,~~, building, and~~/or policy shall follow the~~ life safety related requirements ~~in LMS-CP-7151 and get the approval of the LaRC AHJ~~at LaRC.

~~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 ~~2.4.1.1~~ FIRE, BUILDING AND LIFE SAFETY RULINGS

2.4.1 PURPOSE

This Section outlines the process for issuance of formal fire ~~protection~~, building and life safety 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.

2.4.2 ~~2.4.2~~ SCOPE

~~2.4.2.1~~ This Section shall apply to formal fire ~~protection ruling~~, building and life safety rulings made by the LaRC AHJ for applicable ~~fire protection~~safety codes, standards, and amendments implemented at ~~the~~ LaRC.

2.4.3 ~~2.4.3~~ REQUIREMENTS

2.4.3.1 ~~2.4.3.1~~ General

2.4.3.1.1 ~~2.4.3.1.1~~ Formal fire protection rulings shall provide formal explanations and guidance pertaining to the meaning, applicability or intent of any specific provision ~~or provisions~~(s) of any regulatory document affecting the LaRC Fire Protection Program.

2.4.3.1.2 ~~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 ~~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. Cite applicable edition of NASA-specific criteria, code, standard, or requirement
b. Cite specific paragraph or section number where clarification, interpretation, or ruling is being requested.

2.4.3.2 ~~2.4.3.2~~ Limitations

2.4.3.2.1 ~~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 ~~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 ~~2.4.3.3~~ Method for Requesting Formal Fire ~~Protection Rules~~Building and Life Safety Rulings:

a. A request for a formal rul~~e~~ing shall be ~~directed~~submitted directly 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, and paragraph) of the document and edition of the document on which a formal rul~~e~~ing 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 duly notified.

2.4.3.4 ~~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~~ruling is in proper form to be processed.
b. The LaRC AHJ and~~\~~/or an appropriate staff having expertise in the document~~s~~ or ~~portion~~portions thereof covering the subject under consideration shall review the request, ~~codes~~applicable code requirements, and supporting documentation~~.~~ submitted.
c. The AHJ shall involve any applicable Standard Practice Engineer~~s~~ (SPE~~,~~), Safety Committees, and/or other experts who may ~~have~~possess expertise ~~for~~on the subject ~~ruling~~.
d. A request for a formal rul~~e~~ing may be rephrased by the AHJ in formulation on said ruling. The rephrased version and any pertinent background information shall be sent to the requester and all parties named in the request for a formal rul~~e~~ing.
e. A deadline for receipt of agreement on rephrased ruling request shall be established.

2.4.3.4.1 ~~2.4.3.4.1~~ Approval of Formal Fire Protection Rulings:

a. If the requ~~ir~~ested 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~~retained by the LaRC AHJ.

2.4.3.4.2 ~~2.4.3.4.2~~ Applicability

2.4.3.4.2.1 ~~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 rul~~e~~ing was rendered unless deemed inappropriate by the LaRC AHJ.

2.4.4 ~~2.4.4~~ RESPONSIBILITIES

2.4.4.1 ~~2.4.4.1~~ All LaRC organizations requesting a formal rul~~e~~ing of a mandated fire ~~protection~~, building or life safety code, standard, and/or policy shall submit the request to the LaRC AHJ with the information outlined in this Section.

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

~~4.~~3. ADMINISTRATION ASPECTS/FEATURES

3.1 AUTHORITY HAVING JURISDICTION (AHJ)

3.1.1 PURPOSE

This Section establishes the Authority Having Jurisdiction (AHJ) for the administration and enforcement of fire ~~protection codes, standards, and recommended guides and~~, building and life safety related requirements including NASA-specific criteria, OSHA regulations, NFPA, IBC, IFC and IMC codes, UL and FM requirements, along with referenced standards, guides and recommended practices.

3.1.2 ~~3.1.2~~ SCOPE

~~3.1.2.1~~ This Section shall apply to all fire ~~protection~~, building and life safety related issues~~, codes, standards, at~~ LaRC.

~~**3.1.3 REQUIREMENTS**~~

3.1.3 ~~3.1.3.1~~ REQUIREMENTS

3.1.3.1 General

3.1.3.1.1 ~~3.1.3.1.1~~ The ~~SFAB Head~~SMAO Director may delegate an individual to be the AHJ for all fire ~~protection~~, building and life safety related matters at LaRC.

3.1.3.1.2 The AHJ shall meet the qualifications as stated in STD 8719.11 which includes as a minimum ~~1)~~ :

a. A State certified Fire Officer One
b. ~~2)~~ A Certified Fire Protection Specialist
c. ~~3)~~ 8 ~~years'~~years of experience reviewing plans, documents, and submittals for building and fire code enforcement

~~3.1.3.1.2~~3.1.3.1.3 ~~3.1.3.1.2~~ The individual delegated by the ~~SFAB Head~~SMAO Director 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.

3.1.3.1.3.1 ~~a.~~ A memo shall be signed by the Center Director formally naming the AHJ.

~~3.1.3.1.3~~3.1.3.1.4 ~~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.

3.1.3.2 ~~3.1.4.1~~ Authority of the AHJ

3.1.3.2.1 ~~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, for violations involving fire, building and life safety requirements, and for actions taken by personnel that increase risk of personal injury or property loss.

3.1.3.2.2 ~~3.1.4.1.2~~ The AHJ ~~shall order~~has the authority to direct any person(s) to remove or remedy dangerous or hazardous conditions or materials. Said individuals shall be compelled to fully comply with directive in an expeditious manner.

3.1.3.2.3 ~~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 immediately abate such hazardous conditions ~~that are in violation of the fire protection program~~as deemed appropriate.

~~3.1.3.2.5~~3.1.3.2.4 ~~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~~be related to trade secrets or processes shall not be made part of the public record except as may be directed by a court of law.

~~3.1.3.2.6~~3.1.3.2.5 ~~3.1.4.1.5~~ The AHJ shall have full access to all plans and specifications to ensure compliance with ~~applicable codes~~applicable fire, building and ~~standards~~life safety requirements.

~~3.1.3.2.7~~3.1.3.2.6 ~~3.1.4.1.6~~ When any construction or installation work by a contractor 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 immediately stop work on the portion of the work that is in violation.

~~3.1.3.2.8~~3.1.3.2.7 ~~3.1.4.1.7~~ The notice shall state the nature of the violation.

~~3.1.3.2.9~~3.1.3.2.8 ~~3.1.4.1.8~~ No work shall be continued on that portion until the violation is corrected.

~~3.1.3.2.10~~3.1.3.2.9 ~~3.1.4.1.9~~ The AHJ shall be notified when the ~~installation is~~ violation has been mitigated and ready for re-inspection ~~and conduct the inspection within a reasonable time. Whenever~~. If any installation subject to inspection prior to use is covered or concealed without having first been inspected (e.g., buried piping), the AHJ ~~may~~shall have the authority to require that such work be exposed for inspection.

3.1.3.2.10 ~~3.1.4.1.10~~ The AHJ shall have the authority to approve alternat~~iv~~e materials or methods of construction provided ~~(1)~~ :

a. The proposed alternative is satisfactory and complies with the intent (spirit) of the provisions of the fire protection program; and
b. ~~(2)~~ The material, method~~s~~ or work offered is~~,~~ for the purpose intended, at least the equivalent of that prescribed in the fire protection program ~~in~~for quality, strength, effectiveness, fire resistance, durability, and safety:
   1) Sufficient technical data shall be submitted to substantiate the ~~proposed installation of any material or assembly~~alternative method is reliable and provides equal or greater protection than the prescripted requirements.
   2) 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.
   3) The cost of all tests, reports, and investigations required under this provision shall be paid by the applicant.
   4) 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.

3.1.3.2.11 ~~3.1.4.1.11~~ The AHJ shall order the immediate evacuation of any facility deemed unsafe and ~~present an~~presently posing imminent danger to facility occupants. This authority extends to multiple facilities or to the entire Center as deemed necessary.

3.1.3.2.12 ~~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.

3.1.3.2.13 ~~3.1.4.1.13~~ The AHJ shall ensure that appropriate or duly authorized fire safety education programs and/or public fire safety messages are disseminated to LaRC employees and contractors.

3.1.3.2.14 ~~3.1.4.1.14~~ For matters involving the AHJ with regard to submittals, reviews, approvals, code compliance, and participation on review panels see Section 2.1.3.~~3~~5. For waivers see Section 2.3. For rulings see Section 2.4. For design and document review process see Section 4.3. For certificate of occupancy requirements see Section 6.4.

3.1.3.2.15 ~~3.1.4.1.15~~ The AHJ may consider, approve or reject equivalent systems, methods or devices in lieu of strict prescriptive requirements.

3.1.4 ~~3.1.5~~ RESPONSIBILITIES

3.1.4.1 ~~3.1.5.1~~ Center Director shall:

a. Designate the AHJ.

b. Ensure that the duties and authorities of the AHJ are developed.

3.1.4.2 ~~3.1.5.2~~ Authority Having Jurisdiction (AHJ) shall:

a. Perform the duties delineated in this Section.
b. Enforce the provisions of the LaRC Fire Protection Program.

3.1.4.3 ~~3.1.5.3~~ LaRC Fire Chief shall act as the AHJ for fire ~~protection~~, building 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 ~~3.2~~ FIRE INVESTIGATION AND REPORTING

3.2.1 ~~3.2.1~~ PURPOSE

~~3.2.1.1~~ This Section identifies the requirements for and describes the methods of conducting fire investigations and preparing the investigation reports.

3.2.2 ~~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 ~~3.2.3~~ REQUIREMENTS

3.2.3.1 ~~3.2.3.1~~ This Section is not intended to cover every aspect of a fire investigation. However, certain steps shall be necessary to ~~a~~ensure an accurate report is made of any fire, large or small. The ~~statistics~~cause, performance of personnel and equipment, and lessons learned in the aftermath of a fire ~~are~~is vital in every respect. All facts shall be ~~exposed.~~ well documented.

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

3.2.3.3 ~~3.2.3.3~~ Fire investigations and reports shall be performed and prepared in accordance with ~~the STD8719~~STD 8719.11 and NPR 8715.3 and recorded into the Incident Reporting Information System (IRS).

3.2.3.4 ~~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.

3.2.3.5 ~~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. ~~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~~
3.2.3.6 All 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 ~~3.2.3.7~~ The point of origin and cause of fire shall be determined and documented.

3.2.3.8 ~~3.2.3.8~~ Photographs taken of the complete area shall be included.

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

3.2.4 ~~3.2.4~~ **RESPONSIBILITIES**

3.2.4.1 ~~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 ~~3.2.4.2~~ Fire Department Station Officer shall assist in the investigation of fires, as ~~needed~~requested.

4. DESIGN CRITERIA

4.1 FIRE PROTECTION DESIGN CRITERIA

4.1.1 ~~4.1.1~~ PURPOSE

~~4.1.1.1~~ This Section identifie~~s~~d the fire protection design criteria for new facility designs, upgrades~~,~~ and modifications.

4.1.2 ~~4.1.2~~ SCOPE

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

4.1.2.2 ~~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.

~~4.1.5~~4.1.3 ~~4.1.3~~ REQUIREMENTS

4.1.3.1 ~~4.1.3.1~~ General

4.1.3.1.1 ~~**4.1.3.1.1**~~ Structural Building Requirements

a. ~~a.~~ Structural features of NASA facilities shall be in accordance with this Chapter and the requirements and guidelines of NPR 8820.2, Facility Project Requirements ~~and applicable building codes~~, International Building Code, NFPA and COD Structural Stand Manual~~. Where requirements are conflicting, the most stringent shall apply~~.

b. ~~4.1.3.1.2~~ Where requirements are conflicting, the most stringent shall apply.

4.1.3.1.2 Structural Selection

~~a.~~ Selection of the basic construction classification of proposed NASA facilities shall be made after a thorough review of anticipated occupancy hazards, occupational exposures, floor area, building height, interior construction, automatic sprinkler systems, and costs.

4.1.3.1.3 ~~4.1.3.1.3~~ Fire Resistant Construction

a. ~~a.~~ Every fire wall shall be of noncombustible material having a fire-resistance rating.

b. Telephone/Electrical Rooms ~~.~~ When telephone rooms or electrical closets are located one above the other, with unprotected floor penetrations, the enclosure walls are considered to form a shaft and protection shall be in accordance with the requirements contained in this Chapter and the National Electrical Code, NFPA 70.

c. Fire Partitions ~~.~~ Fire partitions shall be installed around an atrium or stairwell used as part of ~~a~~ required exits and exit access ~~corridor.~~ .

~~c.~~d. The fire rating of the ~~separation~~fire barrier shall be in accordance with the applicable life safety, fire and building codes.

~~d.~~e. ~~The partitions may feature limited amounts of wired glass vision panels.~~ Openings in the fire partitions of an atrium or stairwell shall be limited and must be protected by listed fire dampers, doors, or other assembly approved by the AHJ. A balcony or walkway may be provided on the atrium side of a fire partition provided that it does not form a portion of an exit access corridor, or the atrium is provided with sprinklers and smoke control systems. Under no circumstances will ductwork and other utility penetrations of fire-rated stair enclosures be allowed. Exception: power and communications wiring dedicated solely for use within stairs.

4.1.3.1.4 ~~4.1.3.1.4~~ Fire Stopping

~~a.~~ Through-penetrations ~~("~~("poke-through~~"~~" openings) shall be protected by sealing the penetration with a ~~"~~"fire stopping assembly~~"~~" that is UL listed, FM approved or ~~is FM or~~otherwise certified by a nationally-recognized independent testing laboratory approved for that purpose, ~~and is~~Said protection shall be capable of maintaining the fire-resistance rating of the fire barrier per NFPA 251. For sealing purposes, all floors shall have a minimum rating of 2 hours.

4.1.3.1.5 ~~4.1.3.1.5~~ Labeling Fire Rated Construction

a. ~~a.~~ All new fire rated construction shall be labeled.
b. The label shall describe the wall hourly rating.
c. The lettering of the label shall be made with a minimum of 6-inches red letters and a maximum spacing of 20 feet. The labeling is required for both under floor and above ceiling locations.

4.1.3.2 ~~4.1.3.2~~ Original Design Codes

4.1.3.2.1 ~~4.1.3.2.1~~ The fire ~~protection~~, building and life safety 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. ~~a.~~ In these cases, the facility shall be upgraded to the current requirements of the applicable code or standard.
b. ~~b.~~ If the code of record cannot readily be determined, the ~~Authority Having Jurisdiction~~AHJ shall stipulate the code to be utilized.

4.1.3.3 ~~4.1.3.3~~ Current Codes

4.1.3.3.1 ~~4.1.3.3.1~~ When upgrades or modifications are made, the current edition of the codes shall apply to the upgrade or modification.

4.1.3.3.2 ~~4.1.3.3.2~~ When substantial upgrades or modifications are made on fire protection systems, the entire system shall be upgraded to the current code or standard.

4.1.3.4 ~~4.1.3.4~~ Equipment Testing and Approval

4.1.3.4.1 ~~4.1.3.4.1~~ 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.

4.1.3.4.2 ~~4.1.3.4.1~~ The LaRC AHJ shall have the authority to issue written approval for the use of substitute~~,~~ /equivalent items, ~~if not listed or approved item can be procured because the equipment has never been tested for fire protection use.~~ provided that sufficient justification has been submitted and that the spirit of the code has been met.

4.1.3.5 ~~4.1.3.5~~ Equipment Compatibility

4.1.3.5.1 ~~4.1.3.5.1~~ All equipment components specified in designs shall be compatible with existing equipment and installed as required by the applicable NFPA codes and standards.

4.1.3.6 ~~4.1.3.6~~ Acceptance/Operating Test Procedures

4.1.3.6.1 ~~4.1.3.6.1~~ If ~~NFPA required~~standardized tests are not available or unacceptable to the AHJ, then ~~a~~ written acceptance tests or operating procedures shall be prepared and submitted to the AHJ for review / approval. Upon approval plan shall be executed for all new system installations and/or modifications to verify that the systems perform as required.

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

4.1.3.7 ~~4.1.3.7~~ Site-Specific Requirements

4.1.3.7.1 ~~4.1.3.7.1~~ When site-specific guides or design specifications exist, they shall be included in all fire protection design packages as applicable.

4.1.3.8 ~~4.1.3.8~~ Mandatory Design Criteria

4.1.3.8.1 ~~4.1.3.8.1~~ 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.

~~4.1.6~~4.1.4 ~~4.1.4~~ RESPONSIBILITIES

4.1.4.1 ~~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 ~~4.1.4.2 SFAB Head~~SMAO Director (or Designee) shall ensure that design submittals are reviewed in accordance with and meet the design criteria per LaRC Fire Protection and Safety Requirements, NASA Fire and Safety Policies, and OSHA standards.

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

~~4.1.4.6~~4.1.4.4 ~~4.1.4.4~~ COD shall have the Fire Chief~~'s~~/AHJ as panel members on all PDR and CDR Review Panels. COD shall also include AHJ in the development of Requirement Documents, feasibility and engineering studies, and in meetings discussing possible changes to policy, program or procedures that could impact fire and life safety at LaRC.

~~4.2 PROPERTY LOSS DESIGN CRITERIA~~

~~4.2.1 PURPOSE~~

4.2 ~~4.2.1.1~~ PROPERTY LOSS DESIGN CRITERIA

4.2.1 PURPOSE

This Section provides requirements for limiting property loss from fire.

~~4.2.1~~4.2.2 ~~4.2.2~~ SCOPE

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

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

~~4.2.2~~4.2.3~~4.2.3~~ REQUIREMENTS

4.2.3.1 ~~4.2.3.1~~ Minimum requirements for Installing Automatic Fire Suppression Systems

a. Fire sprinkler systems shall be designed as Ordinary Hazard Group 1 or higher based on NFPA 13. Light hazard sprinkler systems are strictly prohibited~~.~~ regardless of hazard.
b. Include a 10-psi safety factor for new sprinkler ~~systems is required.~~system designs.
c. Recessed quick response sprinkler heads are to be specified ~~where appropriate~~unless inappropriate for situation or otherwise directed by the AHJ.

~~b. Sprinkler head is not required in elevator shaft when criteria of ASTM A17.1 are met.~~

~~4.2.3.4~~4.2.3.2 ~~4.2.3.2~~ Complete automatic fire suppression systems shall be provided and installed according to the applicable NFPA standards ~~or~~and NASA criteria for the following:

a. All new permanent structures or renovations unless deemed otherwise by AHJ.
b. All projects (regardless of funding sources) where the maximum credible fire loss (MCFL) and mission 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.

~~4.2.3.5~~4.2.3.3 ~~4.2.3.3~~ All new sprinkler systems shall be provided with an integrated, self-contained TotalPac System with Viking hardware. It is unacceptable to have systems skid mounted.

~~4.2.3.6~~4.2.3.4 ~~4.2.3.4~~ Dry and preaction sprinkler systems typically ~~having piping~~ filled with compressed air ~~may~~shall utilize compressed nitrogen ~~g~~as instead.

~~4.2.3.7~~4.2.3.5 ~~4.2.3.5~~ Systems shall include both a control valve at the TotalPac, as well as a post indicator valve (PIV) outdoors.

~~4.2.3.8~~4.2.3.6 ~~4.2.3.6~~ The PIV must be located a minimum of 10-foot~~.~~ farther away than the height of the exterior walls unless otherwise approved by the AHJ.

~~4.2.3.9~~4.2.3.7 ~~4.2.3.7~~ All control valves must be equipped with tamper switches.

~~4.2.3.10~~4.2.3.8 ~~4.2.3.8~~ Tamper switches, pressure switches and flow switches all shall be connected to fire alarm system.

~~4.2.3.11~~4.2.3.9 ~~4.2.3.9~~ Fire Department siamese connections must be free-standing and located where the NASA Fire Chief so specifies regardless of circumstances.

~~4.2.3.12~~4.2.3.10 ~~4.2.3.10~~ Fire mains connecting ~~the~~ facility and Center underground water supply shall be a minimum of 6-~~in.~~inches in diameter and solely used for that purpose.

~~4.2.3.13~~4.2.3.11 ~~4.2.3.11~~ All sprinkler systems shall incorporate a reduced pressure principal backflow preventer with test header and tamper switches.

~~4.2.3.12 Unless specified otherwise by the NASA Fire Chief, all closed head sprinklers must have quick-response fusible links.~~

~~4.2.3.16~~4.2.3.12 ~~4.2.3.13~~ Where pendent sprinklers are used in conjunction with finished ceilings, ~~they~~sprinkler heads shall be of the recessed type and centered in the middle of ceiling tiles.

~~4.2.3.17~~4.2.3.13 ~~4.2.3.14~~ Sprinkler piping that is concealed does not have to be painted. Unconcealed sprinkler piping shall be painted RED.

~~4.2.3.18~~4.2.3.14 ~~4.2.3.15~~ All sprinkler piping is required to be labeled.

~~4.2.3.19~~4.2.3.15 ~~4.2.3.16~~ Systems must be hydrostatically tested for leaks at 200-psi for a period of 2-hours.

~~4.2.3.20~~4.2.3.16 ~~4.2.3.17~~ Acceptance testing must comply with applicable NFPA and NASA criteria.

~~4.2.3.21~~4.2.3.17 ~~4.2.3.16~~ Acceptance testing and hydrostatic testing shall be performed by installation contractor and witnessed by the NASA Fire Chief.

~~4.2.3.22~~4.2.3.18 ~~4.2.3.17~~ The determination of whether a system passes or fails lies solely with the NASA Fire Chief.

~~4.2.3.18 The FDC should serve the sprinkler system and interior standpipe system in buildings equipped with both.~~

~~4.2.3.25~~4.2.3.19 ~~4.2.3.19~~ All standpipes and sprinkler systems should be interconnected so that each FDC serves all fire protection needs simultaneously.

~~4.2.3.26~~4.2.3.20 ~~4.2.3.20~~ Explosive hazardous facilities and ~~large~~ facilities with heavy fire ~~load facilities~~ loading shall be provided with a remotely located FDC as specified by the NASA Fire Chief.

~~4.2.3.21~~ Each new FDC shall be unobstructed and located within 50 feet of a fire hydrant.

4.2.3.294.2.3.21 4.2.3.22 For new construction, the FDC New fire hydrants shall be within 100 ft. of the fire hydrantinstalled in instances where it is difficult to comply with this requirement.

4.2.3.304.2.3.22 Permanent signs reading, ""“STANDPIPE AND AUTOMATIC SPRINKLER"” shall be provided.

4.2.3.314.2.3.23 4.2.3.23 FDCs shall be provided with protective caps and chains (minimum length of this chain shall be 12 inches.).

4.2.3.324.2.3.24 4.2.3.24 If the FDC does not protect 100 percent of the facility, the area protected shall be identified on the FDC.

4.2.3.25 SPRINKLER SYSTEMS

4.2.3.25 4.2.3.25.1 SPRINKLER SYSTEMS

4.2.3.25.1 Automatic sprinkler protection shall be provided for all new building/facility construction.

4.2.3.25.2 4.2.3.25.2 Sprinklers shall be provided in renovation projects involving over 50 percent of the building.

4.2.3.25.3 4.2.3.25.3 Sprinklers shall be consideredrequired for renovation projects overexceeding 2,500 square feet.

4.2.3.25.4 4.2.3.25.4 Sprinklers shall be installed, if required by the AHJ due to occupancy change. or use

4.2.3.25.5 4.2.3.25.5 Partially-sprinklered buildings shall be considered as non-sprinklered.

4.2.3.25.6 4.2.3.25.6 Hydraulically designed sprinkler systems shall be designed for a system demand of at least 10-psi below the water supply curve provided for the project by the NASA AHJ.

4.2.3.25.7 The minimum design density for NASA facilities shall be Ordinary Hazard Group 1, no exceptions.

4.2.3.25.94.2.3.25.7 4.2.3.25.8 Water flow alarms, interconnected with the building fire alarm system and central fire reporting system shall be provided for each floor level

protected by the automatic sprinkler ~~system~~syOn large facilities floors shall be divided into zones whereby location of sprinkler head operation can be readily determined.

~~4.2.3.25.10~~4.2.3.25.8 ~~4.2.3.25.9~~ For smaller buildings, where the location of a fire would be readily apparent, only one water flow alarm is necessary.

~~4.2.3.25.11~~4.2.3.25.9 ~~4.2.3.25.10~~ All valves on connections to fire protection water supplies ~~and on supply pipes~~ to sprinklers shall be of the indicating type with tamper switches that activate a supervisory signal on the building fire alarm system when operated.

4.2.3.25.9.1 ~~a.~~ EXCEPTIONS TO THIS ARE:

- ~~*Valves 2.5 inches (64 millimeters) or less in size,*~~

~~b.~~a. Standpipe valve hose connection outlets~~,~~
~~c.~~b. Drain valves~~,~~
~~d.~~c. Inspector~~'~~'s test valve~~s,~~
~~e.~~d. Valves located in areas where the installation of tamper switches is impractical~~, and~~
~~f.~~e. Underground valves with the exception of PIV valves that may be secured open by the use of a substantial lock~~.~~

~~4.2.3.25.12~~4.2.3.25.10 ~~4.2.3.25.11~~ If sprinkler protection is not provided throughout an existing facility, the area protected by the sprinkler system shall be separated from section~~s~~ not ~~protected by the sprinkler~~sprinklered by a fire ~~partition~~barrier of at least 1-hour fire-resistance.

~~4.2.3.25.13~~4.2.3.25.11 ~~4.2.3.25.12~~ Drains ~~-~~ In areas protected by sprinklers that are subject to excessive water damage, floor drains with sufficient capacity shall be provided to handle anticipated accumulation of sprinkler system and fire protection hose stream discharge. (Examples are computer rooms and electronic repair rooms~~.~~).

~~4.2.3.25.14~~4.2.3.25.12 ~~4.2.3.25.13~~ Inspector test connections sh~~ou~~al~~d~~l be located in the most hydraulically remote area from the flow or pressure switch and accessible within 7 feet of the finished floor.

~~4.2.3.25.15~~4.2.3.25.13 ~~4.2.3.25.14~~ Inspector test connections shall have an outlet size equal to the sprinkler head orifice installed and discharge to a location capable of accepting a full flow from the connection until the water flow switch operates.

~~4.2.3.25.17~~4.2.3.25.14 ~~4.2.3.26~~ 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.

~~4.2.3.25.18~~4.2.3.25.15 ~~4.2.3.27~~ 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~~may in the judgment of the AHJ serve as a redundant system.

~~4.2.3.37~~4.2.3.26 ~~4.2.3.8~~ New Structures and additions / modifications to existing facilities shall be of noncombustible construction.

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

~~4.2.3.26.3~~4.2.3.26.1 ~~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.

~~4.2.3.38~~4.2.3.27 ~~4.2.3.9~~ Portable structures shall comply with Section 8.4, “Fire Protection for Portable Structures~~.~~”.

~~4.2.3.39~~4.2.3.28 ~~4.2.3.10~~ Electronic computer systems shall comply with Section 8.10, “Fire Protection for Computer Facilities~~.~~”.

~~4.2.3.40~~4.2.3.29 ~~4.2.3.11~~ All fire alarm systems shall meet as a minimum the requirements listed in the IBC, IFC, NFPA 101 and NFPA 72. The LaRC AHJ ~~can~~shall have the authority to require additional fire, building and life safety protection ~~detection and suppression~~ based on the hazard of a facility, project, or equipment.

4.2.3.29.1 All new fire alarm systems shall be UL listed equipment and compatible with the Notifier Base Center fire alarm system known as OnyxWorks.

4.2.3.29.2 Smoke detectors shall ~~be~~utilize photoelectric technology in order to reduce false alarms and increase overall reliability unless otherwise required by the AHJ.

4.2.3.29.3 An alarm strobe light shall be added to the exterior of the facility at the entrance closest to the FACP.

4.2.3.29.4 Smoke detector placement shall be ~~15ft~~no more than15 feet spacing from a wall and ~~30ft~~30 feet spacing apart ~~for smoke detectors shall be maintained,~~ even in hallways/corridors unless otherwise required by the AHJ. In no case shall devices be installed contrary to its UL listing.

~~oo. Smoke detection is not required in elevator shaft.~~

~~4.2.3.43~~4.2.3.30 ~~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.

~~4.2.3.44~~4.2.3.31 ~~4.2.3.13~~ Special hazards unique to site operations and not addressed by mandatory codes or standards shall be protected per the AHJ.

~~4.2.3.45~~4.2.3.32 ~~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 FIRE ALARM SYSTEMS**~~

4.2.4 ~~4.2.4.1~~ FIRE ALARM SYSTEMS

4.2.4.1 SYSTEM DESCRIPTION

4.2.4.1.1 ~~4.2.4.1.1~~ The fire detection and alarm system and the central reporting system shall be a complete, supervised fire alarm reporting system configured in accordance with NFPA 72~~;~~.

4.2.4.1.2 ~~4.2.4.1.2~~ Exceptions are acceptable as directed by the AHJ.

~~4.2.4.1.3 Furnish~~

4.2.4.1.3 Furnished equipment shall be compatible with current NASA LaRC systems~~,~~ and be UL listed, ~~4.2.4.1.4~~ FM approved, or ~~approved or~~ listed by a nationally recognized testing laboratory.

4.2.4.1.4 ~~4.2.4.1.5~~ A complete fire alarm ~~&~~and detection system shall be provided in all facilities unless determined otherwise by the AHJ.

4.2.4.1.5 ~~4.2.4.1.6~~ Fire alarm ~~&~~and detection systems must be designed, installed and tested in accordance with the provisions of NFPA 70, 72, 101, 29 CFR 1910.165 except as modified by the AHJ.

4.2.4.1.6 ~~4.2.4.1.7~~ The AHJ shall be the sole judge as to what specific elements~~;~~, features and coverage will be required on a case by case basis. This to include any combination of:

a. flow and tampers switches,
b. specialized gas detection systems,
c. duct smoke detectors,
d. status of suppression systems,
e. emergency power status,
f. AEDs,
g. liquid detection~~, elevators,~~ in elevator pits,

h. fire pumps~~,~~ & drivers,
i. voice evacuation,
~~g.~~j. VESDA aspirating smoke detection,
~~h.~~k. beam smoke detectors,
~~i.~~l. flame detectors,
~~j.~~m. heat detectors,
~~k.~~n. smoke detectors,
~~l.~~o. video detectors,
~~m.~~p. horn/strobe notification devices,
~~n.~~q. manual pull stations,
~~o.~~r. automatic closure of doors and
~~p.~~s. Segregation of hazards.

~~4.2.4.1.6~~4.2.4.1.7 ~~4.2.4.1.8~~ All fire alarm systems shall be monitored by the NASA ~~Center's central~~LaRC's proprietary station fire service.

4.2.4.2 ~~4.2.4.2~~ Operation

4.2.4.2.1 ~~4.2.4.2.1~~ Circuits (SLC), Style [5] [6], in accordance with NFPA 72 (unless otherwise designated by the AHJ). Connect alarm notification appliances to notification appliance circuits (NAC), Style Z in accordance with NFPA 72.

4.2.4.2.2 ~~4.2.4.2.2~~ Individual identity ~~of~~shall be provided for each addressable device for the following conditions: alarm; trouble; open; short; and appliances missing/failed remote detector ~~,~~ sensitivity adjustment from the panel for smoke detectors.

4.2.4.2.3 ~~4.2.4.2.3~~ Capability of each addressable device ~~being~~to be individually disabled or enabled from the panel and Central System.
4.2.4.2.4 ~~4.2.4.2.4~~ Size each SLC to provide 40 percent addressable expansion without hardware modifications to the panel.

4.2.4.2.5 ~~4.2.4.2.5~~ Activation of any manual pull station or other alarm initiating device (water flow alarm) shall immediately activ~~at~~e all bells, strobes, horns, rotating beacon lights, or voice alarm speakers that form a portion of the alarm system ~~and activate the fire alarm monitoring system and a visual and audible alarm on the main fire alarm panel and the annunciator panel (if provided).~~***EXCEPTION****: A pre-alarm system, complying with NFPA 101, is permitted subject to approval by the AHJ.*

4.2.4.2.6 ~~4.2.4.2.6~~ An alarm condition on the fire alarm panel shall activate auxiliary devices that are to be interfaced with it, such as motorized dampers and automatic door closers. The fire alarm system shall function satisfactorily under emergency power.

~~The fire alarm system shall function satisfactorily under emergency power~~

~~4.2.4.5~~4.2.4.3 ~~4.2.4.3~~ Operational Features

4.2.4.3.1 ~~4.2.4.3.1~~ Evacuation alarm silencing switch which, when activated, will silence alarm devices, but will not affect the zone indicating LED/LCD nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed device and the NAC devices will be activated.

4.2.4.3.2 ~~4.2.4.3.2~~ The fire alarm control panel shall provide supervised addressable relays for H~~V~~AVC shutdown. An override at the HVAC panel shall not be provided.

~~4.2.4.6~~4.2.4.4 ~~4.2.4.4~~ Battery Backup Power

4.2.4.4.1 ~~4.2.4.4.1~~ Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

4.2.4.4.2 ~~4.2.4.4.2~~ The batteries shall last a minimum of 48 hours substantiating battery calculations for supervisory and alarm power requirements ~~shall be performed.~~ .

4.2.4.4.3 ~~4.2.4.4.3~~ Calculations of the ampere-hour requirements for each system component and each panel component, and the battery recharging period shall be included in submittal package.

4.2.4.4.4 ~~4.2.4.4.4~~ Voltage drop calculations for notification appliance circuits ~~to~~shall be submitted for approval. Calculations shall indicate that sufficient voltage is available for proper appliance operation.

~~4.2.4.5 SUBMITTALS~~

4.2.4.5 ~~4.2.4.5.1~~ Submittals

4.2.4.5.1 Detail drawings~~,~~ shall be prepared and signed by a Registered Professional Engineer or a NICET Level [3] [4] certified Fire Alarm Technician, as specified.

4.2.4.5.2 ~~4.2.4.5.2~~ A smoke detector sh~~ou~~al~~d~~l be shown on the drawings per NFPA 72, Paragraph 1-5.6.

4.2.4.5.3 ~~4.2.4.5.3~~ Testing

4.2.4.5.3.1 ~~4.2.4.5.4~~ All system testing shall be performed per NFPA and NASA specification requirements.

4.2.4.5.3.2 ~~4.2.4.5.5~~ Testing shall include sound readings ~~thought out the~~throughout a facility to ~~i~~ensure the audible alarm is at least 15db above ambient noise level. This shall be witnessed by the AHJ.

4.2.4.5.3.3 ~~4.2.4.5.6~~ All fire alarm and sub system alarms that are tied to the fire alarm system shall be tested as a whole and witnessed by the AHJ.

~~4.2.4.6 ADDRESSABLE MANUAL FIRE ALARM STATIONS~~

4.2.4.6 ~~4.2.4.6.1Stations~~ Addressable Manual Fire Alarm Stations

4.2.4.6.1 Stations shall be of the double-action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color.

4.2.4.6.2 ~~4.2.4.6.2~~ Stations requiring the breaking of glass or plastic panels for operation are not acceptable.

4.2.4.6.3 ~~4.2.4.6.3~~ Stations shall be mounted at a maximum of 1.2m (48 inches) above finished floor (AFF) for forward reach and 54 inches AFF for side reach.

4.2.4.6.4 ~~4.2.4.6.4~~ The use of a key shall be required to reset the station. Gravity or mercury switches are not acceptable.

4.2.4.6.5 ~~4.2.4.6.5~~ Switches and contacts shall be rated for the voltage and current upon which they operate.

4.2.4.6.6 ~~4.2.4.6.6~~ Addressable pull stations shall be capable of being field programmed, ~~shall~~ latch upon operation and remain latched until manually reset.

~~4.2.4.7 FIRE DETECTING DEVICES~~

4.2.4.7 ~~4.2.4.7.1~~ Fire Detecting Devices

4.2.4.7.1 All fire alarm initiating devices shall be individually addressable, except where indicated.

4.2.4.7.2 ~~4.2.4.7.1~~ Installed devices shall ~~conform to~~comply with NFPA 70 hazard classification of the area where devices are to be installed.

4.2.4.7.3 ~~4.2.4.7.2~~ Smoke detectors shall be photoelectric ~~or projected beam (where approved~~unless directed otherwise by the AHJ~~) type.~~ .

4.2.4.7.4 ~~4.2.4.7.3~~ Detectors shall contain a visible indicator LED/LCD that shows when the unit is in alarm condition.

4.2.4.7.5 ~~4.2.4.7.4~~ Detectors shall not be installed so as to be adversely affected by vibration or pressure.

4.2.4.7.6 ~~4.2.4.7.5~~ Detectors shall be the plug-in type in which the detector base contains terminals for making wiring connections.

4.2.4.7.7 ~~4.2.4.7.6~~ Detectors shall be located and installed maximum 30 feet apart and 15 feet from an end wall throughout the facility unless prohibited by code ~~prevents it~~or product listing.

4.2.4.7.8 ~~4.2.4.7.7~~ Detectors shall be connected into signal line circuits or initiating device circuits as indicated on the approved drawings.

4.2.4.7.9 ~~4.2.4.7.8~~ Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet away from diffusers of air handling systems.

4.2.4.7.10 ~~4.2.4.7.9~~ Each detector shall be provided with appropriate mounting hardware as required by its mounting location.

~~4.2.4.13~~4.2.4.8 ~~4.2.4.8~~ Projected Beam Smoke Detectors

4.2.4.8.1 ~~4.2.4.8.1~~ The receiver shall contain an LED which is powered upon an alarm condition. Long-term changes to the received signal caused by environmental variations shall be automatically compensated.

4.2.4.8.2 ~~4.2.4.8.2~~ Detectors shall incorporate features to ~~a~~ensure that they are operational; a trouble signal shall be initiated if the beam is obstructed, the limits of the compensation circuit are reached~~, or the housing cover is removed~~.

4.2.4.8.3 ~~4.2.4.8.3~~ Detectors shall have multiple sensitivity settings in order to meet UL listings for the different distances covered by the beam.

4.2.4.8.4 In the event of beam interference for more than three seconds a trouble alarm shall be transmitted.

4.2.4.8.5 ~~4.2.4.9~~ Where beam detectors are mounted greater than 10-ft. above the finished floor, lockable, keyed remote test switches shall be provided for each beam detector. Remote test switches shall be mounted 5-ft. above the floor in easily accessible location.

~~4.2.4.14~~4.2.4.9 Duct Detectors

4.2.4.9.1 ~~4.2.4.9.1~~ Detectors shall be rated for air velocities ~~that include~~being subjected to, including air flows between 500 and 4000 fpm.

4.2.4.9.2 ~~4.2.4.9.2~~ Detectors shall be powered from the fire alarm control panel.

4.2.4.9.3 ~~4.2.4.9.3~~ Sampling tubes shall run the full width of the duct.

4.2.4.9.4 ~~4.2.4.9.4~~ The duct detector package shall conform to the requirements of NFPA 72, NFPA 90A, UL 268A, and shall be UL listed for use in air-handling systems.

4.2.4.9.5 ~~4.2.4.9.5~~ The control functions, operation, reset, and bypass shall all be controlled from the fire alarm control panel.

4.2.4.9.6 ~~4.2.4.9.6~~ Lights to indicate ~~the~~ operation and alarm ~~condition; and~~conditions, as well as the test and reset buttons shall be visible and accessible with the unit installed and the cover in place.

4.2.4.9.7 ~~4.2.4.9.7~~ Detectors mounted above 6 feet and those mounted below 6 feet that cannot be easily accessed while standing on the floor, shall be provided with a remote detector indicator panel ~~containing test and keyed reset switches.~~ .

4.2.4.9.8 ~~4.2.4.9.8~~ Remote lamps and switches, as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall have auxiliary contacts to provide control, interlock, and shutdown functions ~~specified in Section DIRECT DIGITAL CONTROL FOR HVAC AND OTHER LOCAL BUILDING SYSTEMS~~.

4.2.4.9.9 ~~4.2.4.9.10~~ The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

~~4.2.4.10 NOTIFICATION APPLIANCES~~

4.2.4.10 ~~4.2.4.10.1~~ Notification Appliances

4.2.4.10.1 Audible notification appliances shall conform to the applicable requirements of UL 464. Devices shall be connected into notification appliance circuits.

4.2.4.10.2 ~~4.2.4.10.2~~ Devices shall have a separate screw terminal for each conductor.

4.2.4.10.3 ~~4.2.4.10.3~~ Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area.

4.2.4.10.4 ~~4.2.4.10.4~~ Surface mounted audible appliances shall be painted red.

4.2.4.10.5 ~~4.2.4.10.5~~ Recessed audible appliances shall be installed with a grill that is painted red.

4.2.4.10.6 ~~4.2.4.10.6~~ Audible appliance shall have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel integral display.

~~4.2.4.10.7~~ The audible device shall be capable of being silenced by a system ~~silence~~ switch on the remote system~~.~~

~~4.2.4.10.9~~4.2.4.10.7 ~~4.2.4.10.8 The audible device shall be silenced by the system silence switch located at the remote location~~, but shall not extinguish the visual indication.

~~4.2.4.10.10~~4.2.4.10.8 ~~4.2.4.10.9~~ The remote visual appliance located with the audible appliance shall not be extinguished until the trouble or alarm has been cleared.

~~4.2.4.10.11~~4.2.4.10.9 ~~4.2.4.10.10~~ A visual notification device (weatherproof strobe) ~~will~~shall be installed on the exterior of each building containing a control panel at ~~an emergency response~~a location as designated by the AHJ.

~~4.2.4.10.12~~4.2.4.10.10 ~~4.2.4.10.11 Alarms~~Alarm shall be audible in all areas of occupied facilities. Sound level must be a minimum of 15-dB above ambient noise levels, even inside rooms with their doors closed. It shall be the responsibility of the fire alarm contractor to furnish and install sufficient audible occupant notification devices to meet this performance criteria. AHJ will check this for compliance as a part of system acceptance testing.

~~4.2.4.17~~4.2.4.11 ~~4.2.4.11~~ Visual Notification Appliances

4.2.4.11.1 ~~4.2.4.11.1Visual~~Visual notification appliances shall be provided in buildings and facilities in each of the following areas: restrooms and any general usage area ~~(e.g.,~~such as meeting rooms~~),~~, hallways, machine rooms and other high noise areas, lobbies, ~~and any~~break areas, basements, control rooms, high bays, other area for common use~~.~~ work stations of individuals that are hearing-impaired, and where otherwise determined by the AHJ

4.2.4.11.2 ~~4.2.4.11.2 The~~ Visual notification appliances shall be mounted at 2 m (80 inches) AFF or 150 mm (6 inches) below the ceiling, whichever is lower. ~~In general, ADA requires~~ No place in any space or room ~~to~~shall be greater than 15 m (50 feet) horizontally from a visual notification device.

4.2.4.11.3 ~~4.2.4.11.3 Appliance.~~ In large rooms and open spaces, without obstructions over 1.8 m (6 feet) AFF, the designer sh~~ou~~al~~d~~l not suspend visual notification appliances from the ceiling.

4.2.4.11.4 ~~4.2.4.11.4~~ Drawings ~~will~~shall indicate location, dimensions, content, details, and other required information per NFPA 72 as well as to indicate extent of compl~~y~~iance with ADA requirements.

4.2.4.11.5 ~~4.2.4.11.5~~ Visual notification appliances shall conform to the applicable requirements of UL 1971 and ~~the contract drawings.~~ NFPA 72.

~~4.2.4.11.5~~4.2.4.11.6 Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light.

~~4.2.4.11.6~~4.2.4.11.7 Strobe flash rate shall be between 1 to 3 flashes per second and a minimum of 75 candela. Strobes shall be surface/semi-flush mounted.

~~4.2.4.18~~4.2.4.12 ~~4.2.4.12~~ Voice Alarm Evacuation System

4.2.4.12.1 ~~4.2.4.12.1~~ The voice alarm evacuation system shall provide for voice communications, routing and pre-amplification of digital alarm tones and voice (digital and analog) messages. ~~The system shall be zoned for messages (Custom and prerecorded) and tones as indicated on the drawings.~~ in accordance with NFPA 72 unless otherwise directed by the AHJ.

4.2.4.12.2 ~~4.2.4.12.2~~ The ~~Equipment~~system shall ~~match~~be zoned for messages (custom and pre-recorded) and tones as indicated on the ~~fire alarm equipment going installed in the facility~~drawings.

~~4.2.4.19~~4.2.4.13 ~~4.2.4.13~~ Wiring

4.2.4.13.1 ~~4.2.4.13.1~~ Wiring for SLC fire alarm dc circuits shall be No. 16 AWG minimum.

4.2.4.13.2 ~~4.2.4.13.2~~ Wiring for notification fire alarm dc circuits shall be No. 14 AWG minimum with stranded conductors colored insulation, red for positive and black for negative.

4.2.4.13.3 Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. ~~Wiring shall conform to NFPA 70. 3.1.2 Control Panel~~

4.2.4.13.4 Wiring shall conform to NFPA 70. ~~4.2.4.13.3~~ 3.1.2 titled control panel.

~~4.2.4.13.4~~4.2.4.13.5 The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 24 inches nor more than 78 inches above the finished floor.

~~4.2.4.13.5~~4.2.4.13.6 ~~4.2.4.13.4~~ Manually operable controls shall be between 48 inches and 60 inches above the finished floor. Panel shall be installed to comply with the requirements of UL 864~~.~~ and in location approved by the AHJ

~~4.2.4.13.6~~4.2.4.13.7 ~~4.2.4.13.5~~ A wiring trough of sufficient size with cover shall be installed above the panel (minimum 6 inch by 6 inch and 24 inches in length). ~~It shall be~~

~~installed concealed when possible (at locations with a removable ceiling). Provide 2 ¾ conduits and a separate conduit containing the 110VAC power circuit.~~

~~4.2.4.14 Detectors~~

4.2.4.13.8 ~~4.2.4.14.1~~ It shall be installed concealed when possible (at locations with a removable ceiling). Provide two 3/4-in. conduits and a separate conduit containing the 110VAC power circuit.

4.2.4.14 Detectors

4.2.4.14.1 Facility environmental monitoring systems and security systems can share common equipment w~~it~~hen the fire alarm components required in this Chapter~~;~~, however:

a. ~~4.2.4.14.2~~ The performance of the fire alarm system shall not be compromised.

~~c.~~b. ~~4.2.4.14.3~~ The fire alarm system shall comply with the other requirements in this Chapter.

c. ~~4.2.4.14.4~~ The design of the fire alarm system shall provide for both manual and automatic alarm ~~initiationFacilities~~initiation.

~~e.~~d. Facilities with large bays or open areas shall have pull stations located within 200 feet of travel distance from any normal work area.

~~g.~~e. ~~4.2.4.14.5~~ In special risk areas, additional pull stations ~~may~~shall be located as deemed appropriate by the AHJ.

~~i.~~f. ~~4.2.4.14.6~~ Initiation of an automatic alarm shall be via listed water flow switches, tamper switches, smoke detection, heat~~, or linear projected beam detectors, ultraviolet/infrared (UV/IR)~~ detection, flame detectors, emergency generators, fire pumps, video detectors, manual dump and manual pull stations, and alarm initiating devices associated with the activation of fixed, automatic, fire extinguishing systems.

~~4.2.4.14.7~~ Automatic fire detectors shall be installed, tested, and maintained in accordance with NFPA 72~~ and~~, 29 CFR 1910.164~~.~~

g. ~~4.2.4.14~~ and Section 5.8.7 of this document.

~~m.~~h. Units shall have field-adjustable sensitivity feature to compensate for varying environmental conditions.

~~o.~~i. ~~4.2.4.14.9~~ Multiple-Zoned Detection ~~-~~ – In areas having conditions conducive to ~~false~~nuisance alarms or where automatic fire detectors are used to activate a fixed fire suppression system, HVAC shutdown, the closure of fire/smoke barriers, multiple detectors or counting technology ~~may~~shall be utilized in the design where deemed necessary by the AHJ.

4.2.5 RESPONSIBILITIES

~~**4.2.5 RESPONSIBILITIES**~~

~~4.2.5.1~~ Project Manager and/or ~~Facility Coordinator/Facility Safety Head~~FC/FSH shall ensure that all facilities, operations, programs, and activities are designed and built according to the requirements of this Section.

~~**4.3 FIRE PROTECTION AND LIFE SAFETY DESIGN/DOCUMENT REVIEW PROCESS**~~

~~**4.3.1 PURPOSE**~~

4.3 ~~4.3.1.1~~ FIRE, BUILDING AND LIFE SAFETY DESIGN/DOCUMENT REVIEW PROCESS

4.3.1 PURPOSE

This Section delineates the documents requiring LaRC AHJ or designee review and approval.

~~4.3.1~~4.3.2 ~~4.3.2~~ SCOPE

~~4.3.2.1~~ This Section shall apply to the review of work orders/job packages, requirements documents, statements of work, preliminary planning documents, and design documents for construction projects, including construction submittals.

~~**4.3.3 REQUIREMENTS**~~

4.3.3 ~~4.3.3.1~~ REQUIREMENTS

4.3.3.1 Work Orders/Maintenance Job Packages

a. LaRC AHJ or Designee shall perform fire protection review of work orders for fire protection, life safety concerns, and code compliance.

b. AHJ shall sign the work order package if, after reviewing work orders, it is determined that there are no concerns or that such concerns are adequately addressed.

~~. 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.~~

~~d.~~c. AHJ shall make sure appropriate Safety and ~~Standard Practice Engineer~~SPE personnel have seen package before signing as approved.

4.3.3.2 ~~4.3.3.2~~ Work shall not commence until work orders are signed by the LaRC AHJ (or Designee).

4.3.3.3 ~~4.3.3.3~~ Preliminary Planning Documents

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

~~b.~~ LaRC AHJ or Designee shall ~~:~~

~~d.~~b. ~~(1)~~ perform fire protection review~~s~~ of all preliminary planning documents including the following:

a) Data sheets
b) Conceptual design reports
c) Project design standards
d) Conceptual design drawings
e) Drawings and specifications
f) ~~c.~~ Engineering feasibility studies
g) Requirements Document
h) Scope of project

~~e.~~c. Prepare and submit written comments on the fire protection review comment record.

~~f.~~d. ~~d.~~Consult with document originator to clarify review comments, as necessary.

e. ~~4.3.3.7~~ Make determination whether or not proposal is in compliance with all applicable NASA, LaRC, OSHA, NFPA, FM and International Codes requirements.

f. Approve or reject planning documents.

4.3.3.4 Design Documents

4.3.3.5 ~~4.3.3.8~~ COD shall submit ~~preliminary~~all planning documents, including sketches, plot plans, drawings, calculations, and other pertinent design data for review and approval.

4.3.3.6 ~~4.3.3.9~~ LaRC AHJ or Designee shall:

a. ~~a.~~ Perform fire ~~protection~~, building and life safety reviews of all design documents including:

1) Design Engineering reports
2) Requirement Documents
3) Statement of Work
4) Design/Construction criteria
5) Specifications
6) All drawings (including shop drawings)
~~5)~~7) Design basis documents (including fire hazard analyses)
~~6)~~8) Job plans
9) Code analysis reports
~~7)~~10) Quality Control checklist
~~8)~~11) Design calculations (related to fire ~~protection)~~, building and life safety requirements.
~~9)~~12) Preliminary safety analys~~i~~es reports
~~10)~~13) Fire hazard analys~~i~~es (to the existent required by AHJ)
14) Shop Drawings

b. Prepare and submit written comments~~.~~
c. Consult with document originator to clarify review comments, if necessary.

d. ~~4.3.3.10~~ Make determination whether or not proposal is in compliance with all applicable NASA, LaRC, OSHA, NFPA, FM and International Codes requirements.
e. Approve or reject planning documents.

4.3.3.7 Construction Submittals for Fire Protection Systems

4.3.3.7.1 ~~4.3.3.11~~ COD or the organization having worked performed shall submit construction submittals / shop drawings for review / approval.

4.3.3.7.2 ~~4.3.3.12~~ LaRC AHJ or Designee shall:

a. ~~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~~., gas suppression~~. gaseous suppressions systems, dry chemical, wet 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~~
8) Fire doors and fire~~\~~/smoke damper
9) Gas and chemical storage areas
10) ~~b.~~ Gas monitoring systems
11) Elevators
12) Construction / modification of facilities or change of use.

13) Storage, handling and use of compressed gases and flammable/combustible liquids, hazardous materials
14) Changes affecting fire department access.

b. Sign construction submittals ~~for fire protection systems~~ which are acceptable.
c. Review~~er~~ may ~~stamp~~include plans stamped as "Acceptable, With Comments~~."~~". So long as submittal originator ~~properly~~ addresses comments~~.~~ to satisfaction of AHJ
d. ~~c.~~Prepare and ~~submit~~issue written comments for those submittals deemed not acceptable.
e. ~~d.~~Consult with document originator to clarify review comments, as necessary.

4.3.4 ~~4.3.4~~ RESPONSIBILITIES

4.3.4.1 ~~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 ensure~~s~~ that prompt action is taken with the design team to resolve comments prior to ~~permitting~~commencement of work ~~to commence~~.
c. Have final document, drawing, or ~~function approval~~functional signed and approved by AHJ.

~~. 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.~~

~~4.3.4.4~~4.3.4.2 ~~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, LIFE SAFETY, AND CODE COMPLIANCE ASPECTS**~~

~~**4.4.1 PURPOSE**~~

4.4 ~~4.4.1.1~~ FACILITY MODIFICATIONS AND NEW FACILITIES AFFECTING FIRE PROTECTION, LIFE SAFETY, AND CODE COMPLIANCE ASPECTS

4.4.1 PURPOSE

This Section delineates the criteria for facility modifications which affect fire protection, life safety, and code compliance aspects. It also establishes the requirements for the LaRC AHJ's participation in the facility design, construction, and acceptance process.

~~4.4.1~~4.4.2 ~~4.4.2~~ SCOPE

~~4.4.2.1~~ This Section shall apply to the review and approval of modifications to existing facilities ~~or~~/processes as well as new facilities/processes.

~~4.4.2~~4.4.3 ~~4.4.3~~ REQUIREMENTS

4.4.3.1 ~~4.4.3.2~~ No modifications in the use or occupancy of any facility or portion thereof shall be made without the approval of the LaRC AHJ.

4.4.3.2 ~~4.4.3.3~~ Modifications which require review and approval by the AHJ shall include (but not limited to) the following:

a. Changes in the use/occupancy 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/addition 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.
k. Changes that ~~e~~affect fire department access.

4.4.3.3 ~~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.

4.4.3.4 ~~4.4.3.5 Alterations~~Alternations or repairs shall not cause an existing facility to become unsafe or create a non-compliance.

4.4.3.5 ~~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.

4.4.3.6 ~~4.4.3.7~~ Situations that present an unusual 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.

4.4.3.7 ~~4.4.3.8~~ Alterations shall be submitted and reviewed in accordance with this Section ~~4.4 of this document~~ prior to beginning work.

~~4.4.3.11 Facility Acceptance~~

~~4.4.3.10~~4.4.3.8 ~~4.4.3.12~~ Construction Supervisor or Contractor shall provide advanced notice of facility acceptance to the ~~Facility Coordinator/Facility Safety Head~~FC/FSH for existing facility modifications or to the project engineer for new construction.

~~4.4.3.11~~4.4.3.9 ~~4.4.3.13~~ 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 3 working days is required to allow for scheduling of personnel.
b. Participate in the preliminary walkthrough of the facility.
c. Ensure that all the 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~~.~~ that must be resolved to the satisfaction of the AHJ before project moves forward.
e. Submit the list of deficiencies or concerns generated during the preliminary walkthrough to the responsible ~~Facility Coordinator~~FC and/or ~~facility safety head~~FSH 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~~FC/FSH 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~~FC/FSH or the Project Engineer of remaining fire protection and life safety deficiencies and concerns.
i. ~~Facility Coordinator/Facility Safety Head~~FC/FSH or Project Engineer shall notify the LaRC AHJ when all identified fire protection and life safety deficiencies and concerns have been corrected.

~~4.4.3~~4.4.4 ~~4.4.4~~ RESPONSIBILITIES

4.4.4.1 ~~4.4.4.1 Facility Coordinator/Facility Safety Head~~FC/FSH or Project Manager shall notify the LaRC AHJ when facility modifications or new construction is being contemplated or performed.

4.4.4.2 ~~4.4.4.3~~ Project Manager shall provide AHJ with no less than 5 business days advanced notice of scheduled acceptance testing.

~~4.5 SITING OF FACILITIES~~

4.5 ~~4.5.1~~ SITTING OF FACILITIES

4.5.1 Exposure Protection Factors shall be used ~~–~~ for minimum fire separation distance between buildings, see NFPA 80A and the ~~applicable building codes~~International Building Code.

4.5.2 ~~4.5.2~~ Trailers and mobile home units shall be located at least 25 feet from permanent buildings and at least 25 feet apart, unless joined to form a single complex.

~~**4.6 WATER SUPPLY REQUIREMENTS FOR FIRE PROTECTION**~~

4.6 ~~4.6.1~~ WATER SUPPLY REQUIREMENTS FOR FIRE PROTECTION

4.6.1 Water supply shall comply with and be capable of meeting both fire protection and domestic demand for that area/facility.

4.6.2 ~~4.6.2~~ Dedicated water supply for fire sprinkler systems shall be a minimum of 6 inches in diameter.

4.6.3 ~~4.6.3~~ Domestic water supply and fire protection water supply shall not be shared by a single feed from the main line.

4.6.4 ~~4.6.4~~ Water supply for fire protection shall be provided with a Post Indicator Valve (PIV) on the exterior of the building, as well as an indicating shut-off valve inside of the facility.

4.6.5 ~~4.6.5~~ All fire protection control valves, including PIV's, shall be equipped with electronic tamper switches connected to the building fire alarm system, as well as, having a means to manually lock said valves.

4.6.6 ~~4.6.6~~ Fire hydrants shall be selected based on local site conditions and be located adjacent to paved areas as follows:

a. Not over 400 feet apart so that every permanent facility can be served from not less than two hydrants using not more than 300 feet of hose per hydrant outlet.
b. Not less than 40 feet from a building~~.~~
c. Not less than 3 feet nor more than 7 feet from the roadway shoulder or curb line.
d. Not less than 7 feet from an obstruction.
e. With at least 18 inches between the lowest hydrant outlet and grade and not more than 4 feet between the operating nut and grade.
f. With the principal discharge facing the nearest roadway.
g. ~~A~~An underground hydrant isolation valve shall be installed.
h. The valve shall be an underground gate with a road box and be located at least 5 feet from the centerline of the hydrant.
i. Hydrants shall be equipped with one 4.5 inch and two 2.5 inch connections with American National Fire Hose Connection Screw Threads.
j. Painting shall be in accordance with NFPA 291.

k. Hydrant tops and caps shall be painted to denote flow capacity of the hydrant.
l. Hydrants shall, as a minimum, be connected to a 6-inch supply line.
m. In situations where a hydrant cannot be located away from traffic (e.g., loading dock and warehouse areas), it shall be equipped with sturdy ~~barriers~~bollards for mechanical protection.
n. The arrangement of the ~~barriers~~bollards shall not interfere with the connection to/or operation of the hydrant.
o. Meter~~s~~ shall not be installed ~~in~~on firewater distribution systems.

4.6.7 ~~4.6.7~~ 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. Exception:~~
EXCEPTION: *A single feed shall be allowed, provided the system is reviewed and approved by AHJ.*

4.6.8 ~~4.6.8~~ The water supply for fire protection shall have a minimum supply duration of 2 hours.

4.6.9 ~~4.6.9~~ New primary distribution mains in no case shall be smaller than 12-inches.

4.6.10 ~~4.6.10~~ Building/facility loops shall be 8-inches or larger.

~~4.7 LIFE SAFETY DESIGN, MEANS OF EGRESS ACCESSIBILITY~~

4.7 ~~4.7.1~~ LIFE SAFETY - DESIGN, MEANS OF EGRESS, ACCESSIBILITY

4.7.1 All NASA buildings shall comply with the following:

Applicable~~Appropriate~~ provisions of NFPA 101.International
~~b.~~a. ~~Applicable State and local~~ Building Codes.
~~c.~~b. Egress routes and exits shall comply with the requirements of NFPA 101.
~~d.~~c. Rooms, corridors, fire doors, and the like shall not be altered in any manner that would reduce the required level of ~~fire~~ safety.
~~e.~~d. Modifications shall be subjected to review/approval by the AHJ or authorized designee.
~~f.~~e. Normally secured rooms shall be placarded with an access contact phone/location or rendered visible to emergency response personnel from the corridor via a vision panel.
~~g.~~f. Where a vision panel is installed for this or any other purpose, it shall be maintained free of obstruction (i.e., paint, posters).
~~h.~~g. The use of exit signs containing Tritium or any other radioactive material is strictly prohibited.

4.7.2 ~~4.7.2~~ Open Plan Office Space

a. Open plan office space denotes floor areas characterized by the lack of fixed ceiling-high partitions and conventional doorways.
b. Every open plan floor area shall have at least two easily identifiable exits in accordance with NFPA 101.
c. Interior walls, partitions, modular partitions, and ceiling finish materials shall be Class A (0-25) as defined by ASTM E84.

~~4.22~~4.8 ~~4.8~~ SPECIAL FIRE SUPPRESSION SYSTEMS

4.8.1 Chemical Fire Extinguishing Systems

See NASA STD-8719.11 ~~add section~~Section 8.5.

4.8.2 Clean Agents

4.8.2.1 Alternative clean agent fire extinguishing systems shall be designed, installed, and maintained in accordance with NFPA 2001. NASA Langley only utilizes FM-200 clean-agent fire extinguishing systems unless directed otherwise by the AHJ.

4.8.2.2 Essential equipment areas where the maximum possible fire loss exceeds ~~twenty five ($~~25~~)~~ million ~~dollars~~ (this would include the construction of the area housing the equipment, the equipment within the area, and the cost to replace any data/information lost due to a fire or water damage) shall be equipped with a gaseous clean agent fire extinguishing system in addition to automatic fire sprinklers.

4.8.2.3 For areas where the installation of these extinguishing systems may not be feasible due to openness of the area, the size of the area or type of equipment in the area, the AHJ shall be consulted and/or a Performance-Based Fire Safety Design shall be conducted in accordance with Section 2.4~~.5~~ of this ~~standard.~~document.

~~4.8.2.3~~4.8.2.4 Fire extinguishing systems that may cause asphyxiation due to its air displacement properties shall not be installed in occupied areas. New CO2 fire extinguishing systems are strictly prohibited at LaRC.

~~**Foam**~~

4.8.3 FOAM

See NASA STD-8719.11 ~~add section~~Section 8.7.

~~**Water Spray**~~

4.8.4 WATER SPRAY

See NASA STD-8719.11 ~~add section~~Section 8.8.

~~4.9 MECHANICAL REQUIREMENTS, SPRAY BOOTHS, FUME HOODS, RANGE HOODS~~

~~4.9.1~~
4.9 MECHANICAL REQUIREMENTS - SPRAY BOOTHS, FUME HOODS, RANGE HOODS

4.9.1 Air Conditioning Systems

~~4.9.1.1~~ Except as specified below, all air conditioning and ventilation systems for the handling of air, not contaminated with flammable ~~or~~ explosive vapors or dust, shall comply with this document.

~~4.9.3~~4.9.2 ~~4.9.2~~ Heating Equipment

4.9.2.1 ~~4.9.2.1~~ Depending on the nature of the fuel, heating equipment shall comply with the appropriate provisions of NFPA 31, 54, 58, 59A, 86, 211, and Factory Mutual Data Sheets except as ~~noted~~ otherwise noted.

4.9.2.2 ~~4.9.2.2~~ Furnaces and Boilers

4.9.2.2.1 ~~4.9.2.3~~ Furnaces and boilers for central heating systems shall be located in a room separated from the remainder of the facility by fire-resistive construction (including walls and ceiling).

4.9.2.2.2 ~~4.9.2.4~~ If a sprinkler system is provided, the fire-resistance rating shall be a minimum of 1 hour.

4.9.2.2.3 ~~4.9.2.5~~ If no sprinkler system is provided, the fire-resistance rating shall be a minimum of 2 hours.

4.9.2.2.4 ~~4.9.2.6~~ Openings shall be protected by listed fire doors ~~or~~and dampers.

4.9.2.2.5 ~~4.9.2.7~~ Operations ~~,~~ shop, storage, or other operations, not directly related to the boiler operation, in~~vo~~cl~~v~~uding flammable materials, shall not be located in boiler rooms.

~~4.9.2.8 Burners - Regardless of size, burners on suspended oil-fired heaters shall be provided with flame supervision that ensures shutdown in not more than 4 seconds if flame failure occurs or trial for ignition does not establish a flame.~~

~~4.9.2.2.8~~4.9.2.2.6 ~~4.9.2.9~~ Space Heaters ~~-~~– fixed space heaters shall be approved or listed by the American Gas Association (AGA), ~~LTL,~~UL or other nationally recognized testing authority and installed in complete compliance with all of the requirements of the manufacturer and ~~the laboratory involved~~its listing.

~~4.9.2.2.9~~4.9.2.2.7 ~~4.9.2.10~~ Each fuel-fired space heater shall be vented.

~~4.9.2.2.10~~4.9.2.2.8 ~~4.9.2.11The~~The clearances specified by the manufacturer and~~/or the laboratory~~ its listing shall be maintained between the space heater and combustible materials.

~~4.9.4~~4.9.3 ~~4.9.3~~ Gas

4.9.3.1 ~~4.9.3.1~~ Gas piping entry into ~~the~~a building shall be protected against the possibility of breakage due to settling or vibration as per NFPA International Mechanical Code.

4.9.3.2 ~~4.9.3.2~~ Where practical, piping shall be brought above grade and provided with a swing joint before entering the building.

4.9.3.3 ~~4.9.3.3~~ The physical arrangement and venting shall be such that a break in the gas line due to settling or other causes at/or near the point of entry cannot result in the free flow of gas into the building.

4.9.3.4 ~~4.9.3.4~~ Automatic gas shut off shall be required.

4.9.3.5 ~~4.9.3.5~~ To avoid placing any strain on the gas piping, any meters, regulators, or similar attachments shall be adequately supported.

4.9.3.6 ~~4.9.3.6~~ Any Vents or rupture discs on ~~the~~ equipment shall be vented to the outside of the building.

4.9.3.7 ~~4.9.3.7~~ Earthquake sensitive shutoff valves shall be provided for each gas entry into buildings located in earthquake-prone areas.

4.9.3.8 ~~4.9.3.8~~ Gas piping shall not be run in any space between or directly behind a structural member and its ~~fireproofing~~fire-proofing.

4.9.3.9 ~~4.9.3.9~~ Gas meter rooms shall be ventilated in a manner which ensures removal of any gas leakage without moving it through the structure.

4.9.3.10 ~~4.9.3.10~~ For large capacity gas services over 3-inches (76 millimeters) diameter at 4-inches (102 millimeters) of water pressure head or any other size having

equivalent or greater delivery capabilities~~),~~, the piping shall be enclosed in fire-resistive shafts and vented directly to the outside at top and bottom.

4.9.3.11 ~~4.9.3.11~~ Any horizontal runs of the gas pipe shall be enclosed in a conduit or chase, also directly vented at each end to the exterior or to the vented vertical shaft.

4.9.3.12 ~~4.9.3.12~~ Gas detection and automatic shutoff shall be provided.

~~4.9.5~~4.9.4 ~~4.9.4~~ Elevators

4.9.4.1 ~~4.9.4.1~~ The design, installation, testing, and maintenance of elevators, conveyers, dumbwaiters, and escalators shall be in accordance with the requirements contained in NFPA 101 ~~and~~, ANSI A17.1~~,~~ and ANSI A17.3, "Safety Code for Existing Elevators and Escalators~~.~~".

- ~~Elevator shafts are not required to have sprinkler heard or smoke detection.~~

~~b.~~a. Elevator mechanical room is required to be sprinklered.

~~c.~~b. Elevator mechanical room shall have a shut trip ~~for~~to de-energize electrical equipment.

~~f.~~c. ~~4.9.4.2 Elevator mechanical room~~ Shunt trip shall ~~have a~~operate by activation of 135 °F heat detector ~~to setoff shunt trip~~(s) before the flow of water from sprinkler system.

~~4.10 SEGREGATION OF HAZARDS, FIRE RATED CONSTRUCTION, FLOOR OPENINGS, SHAFTS, FIRE DOORS, FIRE/SMOKE DAMPERS~~

~~4.10.1~~

4.10 SEGREGATION OF HAZARDS, FIRE-RATED CONSTRUCTION, FLOOR OPENINGS, SHAFTS, FIRE DOORS, FIRE/SMOKE DAMPERS

4.10.1 A room/area within a facility may present a significantly greater hazard to the facility or its occupants than may be indicated by the occupancy hazard classification of the overall facility. Such rooms/areas shall be separated from the remainder of the structure by ~~a~~ fire ~~partition~~barriers and/or fire suppression system according to the following general rules:

a. If the room/area to be isolated falls within an occupancy hazard classification, one severity level above that of the overall facility ~~(Requirement).~~ For example, an Ordinary Hazard NASA-STD 8719.11A Occupancy (Ordinary Hazard Group 2) library in an Ordinary Hazard ~~(~~Group 1~~)~~ office building requires separation by a minimum 1-hour fire partition or automatic sprinkler protection.

~~b.~~ If the room/area to be isolated falls within an occupancy hazard classification, two or more severity levels above that of the overall facility. For example, an Extra

~~c.~~b. ~~4.10.2~~ Hazard ~~Occupancy (~~Group ~~1)~~1Occupancy chemical laboratory in an Ordinary Hazard ~~Occupancy (~~Group ~~1),~~1Occupancy, office building requires separation by a minimum 2-hour fire partition or 1-hour separation with automatic sprinkler protection.

~~d.~~c. If a room/area contains high value items or is in the location of a critically important operation, it shall be separated from the remainder of the structure by a fire partition having a fire-resistance rating of at least 1-hour and protected by an automatic sprinkler system. Criticality is determined and documented by the AHJ.

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

5.1 FIRE PROTECTION SYSTEM IMPAIRMENTS

5.1.1 PURPOSE

This Section establishes a means to control and manage 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.*

~~5.1.1~~5.1.2 ~~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. ~~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. ~~b.~~ If a fire protection system ~~shall~~is to be left impaired following ~~a~~ normal preventive maintenance inspections or ~~test, this impairment standard~~tests, the requirements set forth by Section 5.1 does apply.

~~5.1.2~~5.1.3 ~~5.1.3~~ REQUIREMENTS

5.1.3.1 ~~5.1.3.1~~ Requests for fire protection system impairments shall be made to the LaRC Fire Chief and the ~~Emergency Dispatcher Officer (EDO).~~Security Service Communication Center (SSCC). (Dispatch 864-5500)

5.1.3.2 ~~5.1.3.2~~ The impairment request shall be evaluated to determine the effect on ~~the~~ overall Center fire protection system as well as the facility and its occupants.

5.1.3.3 ~~5.1.3.3~~ The impairment request shall include the following:

a. Reason for the impairment.
b. Number of hydrants, sprinkler systems, detection systems, combination of 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 ~~5.1.3.4~~ In an emergency, such as an underground main rupture, prompt action shall be taken to isolate the affected portion of the system~~.~~ in order to minimize impact to smallest area possible.

~~a.~~

5.1.3.4.1 Formal impairment requests in an emergency shall be done after the emergency has been mitigated.

5.1.3.5 ~~5.1.3.5~~ For an emergency impairment condition:

a. ~~a.~~ The maintenance personnel and / or Duty Officer shall immediately report the condition to the ~~EDO and duty officer.~~ SSCC. (Dispatch 864-5500).

b. ~~b.~~ The ~~EDO~~SSCC shall notify the LaRC AHJ.

5.1.3.6 ~~5.1.3.6~~ The ~~EDO~~SSCC 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.~~

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

5.1.3.7 ~~5.1.3.8~~ Work shall begin as soon as interim protective measures are instituted and the system(s) are shut off.

5.1.3.7.1 ~~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.

5.1.3.8 ~~5.1.3.9~~ If the impairment continues after normal working hours, the AHJ may request for OSS to perform fire watch duties shall be made.

5.1.3.9 ~~5.1.3.10~~ If a fire occurs, the fire watch shall notify the LaRC Fire Department.

5.1.3.10 ~~5.1.3.11~~ Any valve affected by the impairment shall be tagged. ~~1~~The fire systems maintenance personnel shall prepare a red tag in accordance with LPR 1710.10, ~~"~~"Safety Clearance Procedures~~."~~".

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

~~5.2.3.115.2.3.1 5.1.3.12 If additional protection is required, temporary feed lines (such as temporary piping, hose lines, or electrical service) shall be installed.~~

~~5.1.3.135~~5.1.3.12 ~~5.1.3.13~~ The ~~EDO~~SSCC (Dispatcher) 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.
n.a. Interim protective measures.

5.1.3.165.1.3.13 5.1.3.14 The fire systemFire systems maintenance personnel shall check repair progress, including tagged equipment, at least once per shift.

5.1.3.175.1.3.14 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.

~~5.1.3.19~~5.1.3.15 ~~5.1.3.16~~ A 2-inch drain test shall be conducted on sprinkler systems affected by an impairment.

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

~~5.1.3.20~~5.1.3.16 ~~5.1.3.17~~ The fire system maintenance personnel shall notify the ~~EDO~~SSCC (Dispatcher) that the repairs are completed and all systems are in service.

~~5.1.3.21~~5.1.3.17 ~~5.1.3.18~~ The ~~EDO~~SSCC (Dispatcher) shall reset supervisory alarms and log all systems in service.

~~5.1.3~~5.1.4 ~~5.1.4~~ RESPONSIBILITIES

5.1.4.1 ~~5.1.4.1~~ COD shall:

a. Comply with requirements delineated in this Section when impairing a fire protection system.
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~~FC and/or ~~Facility Safety Head~~FSH actions required to minimize the damage from fire during outages.

~~5.2 UTILITY IMPAIRMENTS AFFECTING FIRE PROTECTION SYSTEMS~~

~~5.2.1 PURPOSE~~

5.2 ~~5.2.1.1~~ UTILITY IMPAIRMENTS AFFECTING FIRE PROTECTION SYSTEMS

5.2.1 PURPOSE

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

~~5.2.1~~5.2.2 ~~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 and life safety 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 and life safety systems are impaired as a result of a normal and usual preventive maintenance inspection or test, this impairment standard shall apply.

5.2.3 ~~5.2.4~~ REQUIREMENTS

5.2.3.1 ~~5.2.4.1~~ COD shall notify the ~~Emergency~~ Security Service Communication Center SSCC (Dispatch ~~Office (EDO~~864-5500) 24-hours in advance of all planned utility outages.

5.2.3.1.1 ~~a.~~ Immediate notification shall be made to the LaRC AHJ in the event of an emergency outage:

a. ~~(1)~~ The emergency fire dispatcher shall notify the LaRC AHJ and fire system maintenance personnel.
b. ~~(2)~~ Utility outages in excess of 24-hours shall require the implementation of Section 5.1 of this document.

5.2.3.2 ~~5.2.4.2~~ The LaRC AHJ shall determine if fire protection systems will be affected by the utility outage.

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

5.2.3.3 ~~5.2.4.3~~ The LaRC AHJ shall ensure that the affected fire protection and life safety system are logged out-of-service.

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

~~5.1.3.45.1.3.1 5.2.4.4 If additional protection is required, temporary feed lines (such as temporary piping, hose lines, or electrical service) shall be installed.~~

~~5.2.3.6~~5.2.3.5 ~~5.2.4.5~~ COD shall notify the emergency ~~EDO~~Security Communication Center. (Dispatch 864-5500) when the utility system is placed back in regular service.

5.2.4 ~~5.2.5~~ RESPONSIBILITIES

5.2.4.1 ~~5.2.5.1~~ COD shall:

a. Comply with requirements delineated in this Section when impairing a utility system which affects fire protection as~~p~~s~~e~~ets.
b. Ensure that utility impairments are restored in a timely manner.

c. Identify to the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH actions required to minimize the damage from fire during outages.

5.2.4.2 ~~5.2.5.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall implement the necessary interim compensatory measures as required by the LaRC AHJ.

5.2.4.3 ~~5.2.5.4 EDO~~Security Service Communication Center SSCC (Dispatch 864-5500) shall complete the tasks delineated in this Section.

~~5.5~~5.3 ~~5.3~~ FIRE PROTECTION SYSTEM WINTERIZATION

5.3.1 ~~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 ~~5.3.2~~ SCOPE

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

5.3.3 ~~5.3.3~~ REQUIREMENTS

5.3.3.1 ~~5.3.3.1~~ Annual Inspections

5.3.3.1.1 ~~5.3.3.2~~ The fire systems 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 from freezing.

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

5.3.3.2 ~~5.3.3.4~~ Any deficiencies identified shall be documented. Corrective action to repair or resolve the deficient condition shall be initiated immediately.

5.3.3.3 ~~5.3.3.5~~ Winterization Inspection Records shall be maintained.

5.3.3.4 ~~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.

5.3.3.5 ~~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. Note: The wrapping of fire protection system piping with insulation or heat tape is strictly prohibited as an acceptable means to prevent freezing.

~~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.~~

~~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 EDO 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.~~

~~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~~

5.4 NONEMERGENCY USE OF FIRE HYDRANTS

5.4.1 PURPOSE

This Section provides the requirements and responsibilities for the nonemergency use of fire hydrants. Fire hydrants shall not be used for the irrigation ~~for~~of vegetation.

~~5.4.1~~5.4.2 ~~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:~~ ***NOTE:*** *This standard shall not apply to fire hydrant/water supply testing.*

~~5.4.2~~5.4.3 ~~5.4.3~~ REQUIREMENTS

5.4.3.1 ~~5.4.3.1~~ Requests for the nonemergency use of fire hydrants shall be made to the LaRC AHJ 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 ~~5.4.3.2~~ Requests for nonemergency use of fire hydrants ~~shall~~may be approved by the LaRC AHJ with the following restrictions:

a. The 4-1/2 -inch port shall be reserved for LaRC Fire Department use only.
b. One of the 2-1/2 -inch fire hydrant ports may be reserved for nonemergency use.
c. The hydrant user shall provide an approved 2-1/2 -inch gate valve on one of the 2-1/2 -inch fire hydrant ports, reduced down to~~1~~ 1-1/2 inches.
d. The hydrant user shall provide a UL listed backflow preventer to protect potable water supply.
e. The hydrant user shall provide the estimated duration of impairment and the amount of water to be used.
f. Other Sections or systems are not already out of service.
g. 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 ~~5.5.1.1~~ 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 ~~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 safely operate.

~~10.1.1~~ ~~5.5.2~~ ~~SCOPE~~

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

~~5.5.5~~5.5.2 ~~5.5.3~~ REQUIREMENTS

~~8.16.3.1 5.5.3.1 General~~

~~5.5.2.3~~5.5.2.1 ~~5.5.3.2~~ Documentation shall be generated for all inspection, testing, and maintenance activities for fire and ~~li~~fire safety systems such as fire alarm, gas, smoke or ~~flame detection~~flame detection and ~~sprinkler~~fire suppression systems.

~~5.5.2.4~~5.5.2.2 ~~5.5.3.3~~ Maintenance inspections shall be designed to determine whether or not the equipment being inspected will operate safely.

~~5.5.2.5~~5.5.2.3 ~~5.5.3.4~~ Inspection, testing, and maintenance documentation shall be reviewed for evidence of equipment aging and wear.

~~5.5.2.6~~5.5.2.4 ~~5.5.3.5~~ The nominal life expectancy of equipment shall be established using accepted industry practices, relevant codes and experience, based on design specification. The design life may or may not equal the nominal life expectancy.

~~5.5.2.7~~5.5.2.5 ~~5.5.3.6~~ 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 remaining life shall be represented as a range of values or a period of time after which the probability of failure becomes unacceptably high.

~~5.5.2.8~~5.5.2.6 ~~5.5.3.7~~ Inspection, testing, and maintenance records (including plans, checklists, notes, reports, and other records associated with the establishment, completion and verification of corrective actions for the fire protection issues) shall be permanent records, retained for the life of the system, maintained by the appropriate section or department.

~~5.5.2.9~~5.5.2.7 ~~5.5.3.8~~ Inspections/tests are to be conducted per applicable codes/contract documents.

~~5.5.2.10~~5.5.2.8 ~~5.5.3.9~~ Failure to comply may result in withholding of final payment and certificate of occupancy.

~~5.5.2.11~~5.5.2.9 ~~5.5.3.10~~ Contractor ~~to~~shall ensure the proper functioning of system/equipment during acceptance testing.

~~5.5.2.12~~5.5.2.10 ~~5.5.3.11~~ Acceptance testing ~~to~~shall be performed by a qualified contractor and witnessed by the AHJ.

~~5.5.6~~5.5.3 ~~5.5.4~~ RESPONSIBILITIES

~~5.5.4.1~~ LaRC AHJ shall ~~:~~
establish a facility fire protection equipment inspection program which produces useful documentation.

~~5.6 INSPECTION, TESTING, AND, MAINTENANCE MATRIX~~

~~5.6.1 PURPOSE~~

5.6 ~~5.6.1.1~~ INSPECTION, TESTING, AND MAINTENANCE MATRIX

5.6.1 PURPOSE

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

~~5.6.1~~5.6.2 ~~5.6.2~~ SCOPE

~~5.6.2.1~~ This Section shall apply to all fire protection and life safety equipment and systems at LaRC.

~~5.6.2~~5.6.3 ~~5.6.3~~ REQUIREMENTS

5.6.3.1 ~~5.6.3.1~~ General

5.6.3.1.1 ~~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)~~ NFPA 25, except for specified deviations approved by the LaRC AHJ.

5.6.3.1.2 ~~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 ~~5.6.3.2~~ Fire Barriers and Walls

5.6.3.2.1 ~~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, constructed and tested to meet the conditions of acceptance in NFPA 251.

5.6.3.2.2 ~~5.6.3.2.2~~ Fire barriers shall be maintained in full compliance with NFPA 101.

5.6.3.3 ~~5.6.3.3~~ Fire Doors and Fire / Smoke Dampers~~.~~

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

5.6.3.3.2 ~~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	Test~~Inspection~~	Annually	Doors	Maintenance	As needed
Hinges	Inspection	Annually	Fire/smoke dampers	Inspection	Annually
Coordinator	Inspection	Annually	Fire/smoke dampers	Test	Annually
Chains and cables	Inspection	Annually	Fire/smoke dampers	Maintenance	Annually

5.6.3.4 ~~5.6.3.4~~ Valves and Fire Department Connections

5.6.3.4.1 ~~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 ~~5.6.3.4.2~~ Valves and fire department connections shall be inspected, tested, and maintained in accordance with Table. 5.2~~.~~

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	Test	Annually
Exterior	Inspection	Monthly	Low air pressure alarm	Test	Quarterly
Interior	Inspection	Annually	Quick-opening devices	Test	Quarterly
Strainers, filters, orifices	Inspection	Annually	Trip test	Test	Annually
			Full flow trip test	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
Exterior	Inspection	Monthly	Pressure relief valve	Test	Annually
Interior	Inspection	Monthly	Hose connection	Test	Annually
Strainers, filters, orifices	Inspection	Annually	Hose rack	Test	5 years
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 ~~5.6.3.5~~ Deluge/Water Spray Systems

5.6.3.5.1 ~~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 ~~5.6.3.5.2~~ Deluge and water spray systems shall be inspected, tested, and maintained in accordance with Table 5.3.

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	Weekly during cold weather
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	Quarterly
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 ~~5.6.3.6~~ Carbon Dioxide Suppression Systems

5.6.3.6.1 ~~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 ~~5.6.3.6.2~~ Carbon dioxide suppression systems shall be inspected, tested, and maintained in accordance with Table 5.4.

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 ~~5.6.3.6.3~~ Other Clean Agent Fire Suppression systems such as FM-200 shall be maintained in accordance with NFPA 2001 and the manufactures written IT&M requirements.

~~5.14~~5.7 ~~5.7~~ HALON EXTINGUISHING ~~agent~~ALERT

~~5.7.1 PURPOSE~~

5.7.1 ~~5.7.1.1~~ PURPOSE

This Section provides the criteria for ensuring chlorofluorocarbon (CFC)-based Halon fire extinguishing agents are not present at LaRC.

~~5.7.3~~5.7.2 ~~5.7.2~~ SCOPE

~~5.7.2.1~~ This Section shall apply to all Fire Suppression Systems and Extinguishers at LaRC with the exception of those in aircraft.

~~5.7.4~~5.7.3 ~~5.7.3~~ REQUIREMENTS

~~5.7.3.1 General~~

~~5.7.3.3~~5.7.3.1 ~~5.7.3.1.1~~ No new Halon fire suppression agent shall be proposed or installed to mitigate fire and life safety hazards at LaRC:

a. Alternative protection in the form of automatic sprinkler ~~suppression~~systems, water-mist, alternative gaseous agents, and pre-action 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.

~~5.7.5~~5.7.4 ~~5.7.4~~ RESPONSIBILITIES

5.7.4.1 ~~5.7.4.1 SFAB Head~~SMAO Director shall ensure CFC-based Halon fire extinguishing agents remain eliminated from NASA LaRC (except legacy systems onboard aircraft).

~~5.7.4.1~~5.7.4.2 FC and/or FSH shall ensure CFC-based Halon fire extinguishing agents remain eliminated from NASA LaRC (except legacy systems ~~on~~onboard aircraft).

~~5.7.4.1.1 Facility Coordinator and/or Facility Safety Head shall ensure CFC-based Halon fire extinguishing agents remain eliminated from NASA LaRC (except legacy systems on aircraft).~~

~~5.8 Fire Pumps (Including Design)~~

5.8 ~~5.7.5.4.1~~ FIRE PUMPS (INCLUDING DESIGN)

5.8.1 Fire pumps shall be designed ~~and~~, installed and maintained to meet the requirements of NFPA 20.

a. Pumps for fire protection shall have adequate capacity with reliable power and water supply.
b. Fire pump design, installation, testing, and maintenance shall comply with NFPA 20 and NFPA 25.
c. Fire pump drivers shall comply with NFPA 37 for diesel engines and NFPA 70 for electric motors.
d. Electric centrifugal fire pumps shall also comply with the relevant requirements of NFPA 70.
e. Fire pumps shall be arranged to start automatically.
f. All fire pumps shall include manual shutdown features.

~~5.8.3~~5.8.2 ~~5.7.5.4.2~~ Fire pumps shall be inspected, tested, and maintained in accordance with Table 5.~~6~~5 below, manufacturer's specifications and NFPA 25.

~~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~~

Table 5.5 - Inspecting, Testing, and Maintenance: *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~~

~~5.8.4~~5.8.3 Fire Water Systems and Fire Hydrants

5.8.3.1 ~~5.7.5.5.1~~ Fire water systems and fire hydrants shall be designed and installed to meet the requirements of NFPA 24.

5.8.3.2 ~~5.7.5.5.2~~ Fire water systems and fire hydrants shall be inspected, tested, and maintained in accordance with Table 5.~~7.~~6 or as ~~AHJ requires to be given~~otherwise required in writing by AHJ.

~~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~~

Table 5.6 - Inspecting, Testing, and Maintenance: Private Fire Service Mains

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

~~5.8.5~~5.8.4 Standpipe Systems

5.8.4.1 ~~5.7.5.6.1~~ Standpipe systems shall be designed and installed to meet the requirements of NFPA 14.

5.8.4.2 ~~5.7.5.6.2~~ Standpipe systems shall be inspected, tested, and maintained in accordance with Table 5.~~8~~7.

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

~~Component~~	~~Activity~~	~~LaRC Frequency~~
~~Control valves~~	~~Inspection~~	~~Monthly~~
~~Pressure regulating devices~~	~~Inspection~~	~~Quarterly~~
~~Piping~~	~~Inspection~~	~~Quarterly~~
~~Hose connections~~	~~Inspection~~	~~Annually~~
~~Cabinet~~	~~Inspection~~	~~Annually~~
~~Alarm device~~	~~Test~~	~~Quarterly~~
~~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~~

Table 5.7 - Inspecting, Testing, and Maintenance: Standpipe and Hose Systems

Component	Activity	LaRC Frequency
Control valves	Inspection	Monthly
Pressure regulating devices	Inspection	Quarterly
Piping	Inspection	Quarterly
Hose connections	Inspection	Annually
Cabinet	Inspection	Annually
Alarm device	Test	Quarterly
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

~~5.8.6~~5.8.5 Facility Emergency Lights

5.8.5.1 ~~5.7.5.6.3.1~~ Facility emergency lights shall be designed and installed to meet the requirements of NFPA 101.

5.8.5.2 ~~5.7.5.6.3.2~~ Facility emergency lights shall be inspected, tested, and maintained in accordance with Section 6.3 of this ~~LPR~~document or as otherwise required by the AHJ.

5.8.5.3 ~~5.7.5.6.3.3~~ Emergency lights that have the visual and audible alarm units that provide the code-required ~~test~~automatic diagnostic testing does not require ~~to have~~ the functional test~~.~~; monthly visual testing still required.

~~5.8.7~~5.8.6 ~~5.7.5.6.4~~ Water Storage Tanks

5.8.6.1 ~~5.7.5.6.4.1~~ Water storage tanks are designed and installed to meet the requirements of NFPA 22.

5.8.6.2 ~~5.7.5.6.4.2~~ Water storage tanks ~~are~~shall be inspected, tested, and maintained in accordance with Table 5.~~10.~~ 8.

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

~~Component~~	~~Activity~~	~~LaRC Frequency~~
~~Condition of water in tank~~	~~Inspection~~	~~Annually~~

~~Water temperature~~	~~Inspection~~	~~Has electronic alarm~~
~~Heating system~~	~~Inspection~~	~~Weekly~~
~~Control valves~~	~~Inspection~~	~~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~~	~~5 years~~
~~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~~

~~5.7.5.6.5~~

Table 5.8 - Inspecting, Testing, and Maintenance: Water Storage Tanks

Component	Activity	LaRC Frequency
Condition of water in tank	Inspection	Annually
Water temperature	Inspection	Has electronic alarm
Heating system	Inspection	Weekly
Control valves	Inspection	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-tem, limit switches	Test	Semi-Annually
Water level alarms	Test	5 years
Level indicators	Test	5 years
Pressure gauges	Test	As needed
Water level	Maintenance	5 years
Drain sediment	Maintenance	As needed
Thermostats	Maintenance	Annually
Cathodic protection	Maintenance	Annually
Drain valves cycled	Maintenance	Annually
Vent screen	Maintenance	Annually
Control valves	Maintenance	Annually
Repairing - steel	Maintenance	As needed
Embankment-supported rubberized fabric (ESRP)	Maintenance	As needed

~~5.8.8~~5.8.7 Fire Alarm and Detection Systems

5.8.7.1 ~~5.7.5.6.5.1~~ Fire alarm and detection systems shall be designed and installed to meet the requirements of NFPA 72.

5.8.7.2 ~~5.7.5.6.5.2~~ Fire alarm and detection systems shall be inspected, tested, and maintained in accordance with Table 5.~~11~~9 and NFPA ~~25~~72.

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		
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

~~5.7.6~~

Table 5.9 - Inspecting, Testing, and Maintenance: *Fire Alarm and Detection Systems*		
Component	**Activity**	**LaRC Frequency**
Alarm Appliances		
Audible devices	Inspection	Annually
Speakers	Inspection	Annually
Visible devices	Inspection	Annually
Batteries		
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	Semi-Annually
Special Procedures	Inspection/Test	Annually
Transient Suppressers	Inspecton	Annually

~~5.8.9~~5.8.8 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.

~~CHAPTER 6~~

~~7.~~6. ~~6.~~ IFE SAFETY

6.1 ~~6.1~~ MEANS OF EGRESS

6.1.1 ~~6.1.1~~ PURPOSE

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

6.1.2 ~~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 ~~6.1.3~~ REQUIREMENTS

6.1.3.1 ~~6.1.3.1~~ Design and Construction of Means of Egress

6.1.3.1.1 ~~6.1.3.1.1~~ COD shall:

a. Ensure that all new facility designs or modifications at LaRC ~~incorporate~~incorporates and complies with the requirements of NFPA 101 Life Safety Code.
b. Ensure that all new facility designs or modifications at LaRC 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 ~~6.1.3.1.2~~ The LaRC AHJ shall review and approve all new designs and modifications to ensure that fire and life safety is adequate to meet the specified criteria and meet all relevant codes.

6.1.3.2 ~~6.1.3.2~~ Maintaining Life Safety in Facilities

6.1.3.2.1 ~~6.1.3.2.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Ensure that all facility exits and means of egress leading to exits are maintained clear and unobstructed at all times.
b. Ensure that material is not ~~stored~~placed in stairwells or corridors of facilities.
c. Ensure that operations barriers such as ~~roped areas~~rope / tape do not affect exit routes.
d. Ensure that life safety features take precedence over security or operations features.

e. Ensure that no furnishings, decorations, supplies 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 so as to prevent ~~unobstructed~~ delayed or obstructed exiting, unless specific, advanced 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.~~.
   3) Fire doors shall not be blocked open unless done so in an approved manner utilizing a magnetic door release mechanism.
   ~~3)~~4) All hardware shall ~~is~~ function properly so that door will easily close and latch after use.
g. Ensure that automatic ~~sprinkler~~ fire suppression systems, gas / fire detection and alarm systems, ~~exit~~emergency lighting, fire doors, and other fire protection features required by ~~the Life Safety~~ Code are continuously maintained in operating condition ~~or that previously approved by LaRC AHJ interim compensatory measures are implemented~~.
h. Ensure that all new interior finishes are Class A rated with a maximum flame spread of 25.
i. Ensure that freestanding partitions and space dividers are manufactured of limited combustible materials and ~~**CLASS A RATED**~~strictly comply with the Life Safety Code.

~~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.~~

~~6.1.7~~6.1.4 ~~6.1.4~~ RESPONSIBILITIES

6.1.4.1 ~~6.1.4.1~~ COD shall ensure that each facility is designed and maintained in compliance with this document.

6.1.4.2 ~~6.1.4.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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.~~

~~6.1.4.5~~6.1.4.3 ~~6.1.4.4 LARC AHJ~~LaRC 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 ~~6.2.1.1~~ FACILITY EVACUATION PLANS

6.2.1 PURPOSE

This Section delineates the requirements for evacuation plans for personnel ~~from~~ occupying LaRC facilities ~~if the diagrams~~ where said plans are installed.

~~6.2.1~~6.2.2 ~~6.2.3~~ **SCOPE**

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

~~6.2.2~~6.2.3 ~~6.2.4~~ **REQUIREMENTS/RESPONSIBILITIES**

6.2.3.1 ~~6.2.4.1~~ Facility Evacuation Diagrams

6.2.3.1.1 ~~6.2.4.1.1~~ A facility evacuation diagram issued by the NASA AHJ may be requested by a ~~Facility Coordinator~~FC and/or ~~Facility Safety Head. If one is requested and installed, it~~FSH. These diagrams shall follow the requirements of this Section.

6.2.3.1.2 ~~6.2.4.1.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall review diagrams to ensure accuracy and that all evacuation routes are correctly 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, areas of refuge, AED's, muster points or other pertinent ~~structural features that are essential to egress~~information may be included.
b. Use directional arrows to illustrate ~~the~~ evacuation paths.
c. Note on the diagram a muster 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, non-required egress paths, and safety showers, as they only complicate the diagrams.

6.2.3.1.3 ~~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.~~

6.2.3.2 ~~6.2.4.2~~ Personnel Evacuation Directions

6.2.3.2.1 ~~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~~muster 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~~SMAO Director.

6.2.3.2.2 ~~6.2.4.2.2~~ Personal needing assistance to evacuate a facility because of known mobility issues, whether temporary or permanent, shall have a “buddy” assigned to them to aid in their emergency evacuation ~~of a facility~~.

6.2.3.2.3 ~~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~~your personal safety~~, and~~. Promptly report ~~such~~ cases of personnel unable to ~~the~~evacuate to responding emergency personnel. Personnel shall perform only those necessary crash, panic, or scram shutdowns which can be done without delaying evacuation. Personnel shall ~~stay~~remain at the designated muster point until released by ~~the~~ emergency personnel.

~~6.3 FACILITY EMERGENCY LIGHTS~~

~~6.3.1 PURPOSE~~

~~6.3.1.1~~

6.3 FACILITY EMERGENCY LIGHTS

6.3.1 PURPOSE

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

~~6.3.1~~6.3.2 ~~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).~~.

~~6.3.2~~6.3.3 ~~6.3.3~~ REQUIREMENTS

6.3.3.1 ~~6.3.3.1~~ Required Emergency Light Testing Program

~~6.3.3.1.1~~ Emergency lights shall be visually inspected monthly~~.~~
~~6.3.3.1.2~~6.3.3.1.1 ~~a. During this inspection, the lights shall be inspected to verify~~ by verifying the following:

a. ~~(1)~~ Electrical cords shall not be damaged, frayed, or longer than 36 inches.
b. ~~(2)~~ Lamps shall not be cracked or damaged.
c. ~~(3)~~ Units shall be securely mounted.
d. ~~(4)~~ Lamps shall be properly positioned to provide illumination for the required area(s~~)~~).
e. ~~(5)~~ Lamps shall not be blocked.
f. ~~(6)~~ Red power LED light on.

~~6.3.3.1.3~~6.3.3.1.2 ~~6.3.3.1.2~~ Non-Self-Testing: All emergency lights shall be operationally tested annually. NFPA ~~standards recommend~~101 requires a 1-1/2-hour operational test.

~~6.3.3.1.4~~6.3.3.1.3 ~~6.3.3.1.3~~ Self-Testing, self-diagnostic: Emergency lights ~~do~~ not required to be operational tested per Section 5.~~7~~8.5.3.

~~6.3.3.1.5~~6.3.3.1.4 ~~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 ~~6.3.3.1.7~~6.3.3.1.5 ~~a.~~ portable emergency lights shall be provided at the affected area(s) until the permanent lights are restored to service.

~~6.3.3.1.8~~6.3.3.1.6 ~~6.3.3.1.7~~ All new emergency lights shall conform to Section 5.~~7.5.6.3 or~~8 as required by AHJ.

~~6.3.4 RESPONSIBILITIES~~

6.3.4 ~~6.3.4.1~~ RESPONSIBILITIES

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

6.3.4.2 ~~6.3.4.2~~ COD shall be responsible for recording the annual testing in the Center's maintenance reporting system for ~~Non~~ all non-self-testing emergency lights.
6.3.4.3 ~~6.3.4.3 Facility Safety Head:~~FSH: The monthly visual inspection and documentation is part of the monthly ~~Facility Safety Head Audit~~FSH audit and mandated by code.

~~6.4 OCCUPANCY PERMIT APPROVAL~~

~~6.4.1 PURPOSE~~

6.4 ~~6.4.1.1~~ OCCUPANCY PERMIT APPROVAL

6.4.1 PURPOSE

This Section outlines the occupancy permitting requirements.

~~6.4.1~~6.4.2 ~~6.4.2~~ SCOPE

~~6.4.2.1~~ This Section shall apply to all LaRC facilities and all off-site locations leased by NASA.

~~6.4.2~~6.4.3 ~~6.4.3~~ REQUIREMENTS

~~6.4.3.1 General~~

~~6.4.3.3~~6.4.3.1 ~~a.~~ Only the AHJ has the authority to issue a Certificate of Occupancy (CO).

6.4.3.46.4.3.2 b. No new construction or renovation project or portion thereof shall not be occupied in whole or part until a CO is issued by the AHJ.

6.4.3.56.4.3.3 6.4.3.1.1 A Certificate of Beneficiary 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.

6.4.3.3.1 This shall be approved by the LaRC AHJ so that furniture and equipment may be installed in the facility and. This excludes occupancy by personnel occupancy/ tenants who may move in only after issuance of the Certificate of Final Occupancy occurs.

6.4.3.66.4.3.4 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 and allows full use of the facility.

6.4.3.76.4.3.5 6.4.3.1.3 A copy of the certificate shall be kept by the facility.

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

6.4.3.86.4.3.6 6.4.3.1.4 No personnel shall occupy an area or facility or operate any processes that have been added, changed, or modified prior to the issuance of a Certificate of Beneficial Occupancy or a Certificate of Final Occupancy.

6.4.3.96.4.3.7 6.4.3.1.5 Before a Certificate of Beneficial Occupancy shall beis issued, the area or facility shall be inspected by the LaRC AHJ and SFAB HeadSMAO Director (or designee) to verify that no imminent danger or serious code / OSHA violations exist as the facility is presently constructed.

6.4.3.106.4.3.8 6.4.3.1.6 Safety deficiencies identified in the issuance of a Certificate of Beneficial Occupancy shall be correctedconnected mitigated in an expeditious manner.

a. a. In no case shall the Certificate of Beneficial Occupancy be valid in excess of 45 days.
b. b. If OSHA, fire, or life safety issues of imminent danger arise after issuance of beneficial occupancy, said deficiencies shall be mitigated within 24 hours; or the Certificate of Beneficial Occupancy shall will be revoked.

6.4.3.116.4.3.9 6.4.3.1.7 Whenever a hazard which would be classified as an imminent danger or in violation of the OSHA standards is identified, the Facility CoordinatorFC and/or Facility Safety Head immediatelyFSH shall take immediate interim corrective actions (i.e. barricade, evacuate, and lock out).) to mitigate hazard

a. a. Permanent corrective actions shall be completed within 24 hours.

b. ~~b.~~ Failure to complete corrective actions within 24 hours shall result in revocation of the Beneficial or Final Occupancy ~~status.~~ permit.

~~6.4.3.12~~6.4.3.10 ~~6.4.3.1.8~~ Whenever a condition which ~~would be~~is classified as a serious violation of ~~the~~ OSHA ~~standards~~or other safety regulations ~~-~~is reported to or observed by the LaRC AHJ, the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ~~immediately barricade the hazardous~~take immediate action to remedy said condition.

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

~~6.4.3.13~~6.4.3.11 ~~6.4.3.2.1~~ A Certificate of Final Occupancy shall be required prior to any processing or use of flammable ~~or~~ /combustible liquids.

6.4.3.11.1 ~~a.~~ An interim flammable/combustible liquids handling plan shall be developed and submitted to the AHJ for approval if such liquids are to be present as a part of the construction necessary to achieve the Certificate of Final Occupancy.

~~6.4.3.14~~6.4.3.12 ~~6.4.3.2.2~~ Permanent~~/~~ / temporary identification of all hazards as required by OSHA ~~and NFPA~~or other applicable codes shall include temporary hazards related to unfinished construction.

a. ~~a.~~ This identification shall be provided by signs, painting/color coding of hazards, and/or barricading.
b. ~~b.~~ Hazard identification signs that will ~~still exist~~remain once the Certificate of Final Occupancy is granted shall be installed ~~before~~prior to the issuance of a Certificate of Beneficial Occupancy.

~~6.4.3.15~~6.4.3.13 ~~6.4.3.2.3~~ Preplanned impairments of automatic fire suppression ~~sprinkler~~ and/or fire alarm systems during the period of Certificate of Beneficial Occupancy are only 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.
~~6.4.3.16~~6.4.3.14 ~~6.4.3.2.4~~ Electrical ~~installation and~~ installations/modifications which are part of new construction shall be ~~verified~~inspected to confirm their compliance with NFPA 70 (National Electrical Code) and NFPA 70E.

~~6.4.3~~6.4.4 ~~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~~site-wide supervised fire alarm system.
b. Emergency evacuation alarms shall be audible in all public parts of the building / area requesting Final Occupancy.
c. Off-site locations shall have a plan approved by the LaRC AHJ.

d. ~~Central~~Propriety station fire alarm monitoring of all fire alarm ~~boxes~~equipment 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 private central station alarm monitoring ~~location~~service and shall be tested to ensure functional operation.
   1) This shall be accomplished in conjunction with the local ~~authority having jurisdiction~~AHJ over the leased space location.
f. Exit signs shall be in place~~.~~ as per Code and illuminated.
g. Emergency lighting shall be fully operational.
h. Fire preplans shall be developed in accordance with Section 10.~~10.~~9.
i. Permanent signs and postings ~~shall be~~as required by OSHA, NFPA, NASA, and LaRC shall comply with the 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~~non-standard signs shall not be acceptable under a Certificate of Final Occupancy.

~~6.4.4~~6.4.5 ~~6.4.3.4~~ Requirements for Off-Site Construction and Modifications

~~6.4.5.2~~6.4.5.1 ~~6.4.3.4.2~~ All off-site leased facilities shall fully comply with the ~~local building and fire codes.~~ Virginia Uniform Statewide Building Codes (current edition).

~~6.4.5.3~~6.4.5.2 ~~6.4.3.4.3~~ All off-site leased space shall be protected by an automatic sprinkler system ~~equipped with a fire alarm monitoring~~monitored by an approved 3rd party central station system.

a. ~~a.~~ The ~~fire alarm~~ monitoring system shall automatically notify the local fire department upon system activation.
b. ~~b.~~ The portion of the facility occupied by LaRC personnel shall fully comply with NFPA 101 (Life Safety Code).

~~6.4.5~~6.4.6 ~~6.4.3.5~~ Issuance of Certificate of Beneficial Occupancy

6.4.6.1 ~~6.4.3.5.1~~ The LaRC AHJ and ~~SFAB Head~~SMAO Director (or Designee) shall verify that all required items of this Section are ~~present~~in compliance and that no imminent danger or serious hazards exist ~~in the area~~. Any item that is in technical ~~noncompliance~~non-compliance with OSHA, NFPA, NASA, or LaRC safety performance requirements ~~is~~ will be noted on the Certificate of Beneficial Occupancy.
a. ~~a.~~ Where appropriate, the ~~noncompliance~~non-compliance shall be identified by tags, barricades, or other interim corrective measures.

b. ~~b.~~ If no imminent danger exists ~~the~~ and adequate safety measures are in place, the AHJ will issue a Certificate of Beneficial Occupancy.

6.4.6.2 ~~6.4.3.5.2~~ The LaRC AHJ shall identify in writing to the ~~Facility Coordinator/Facility Safety Head~~FC/FSH/Project Engineer, all actions ~~necessary prior~~required to ~~the issuance of~~obtain a Certificate of Final Occupancy.

6.4.6.2.1 ~~a.~~ The Certificate of Beneficial Occupancy shall not be issued until all interim corrective measures are physically in place and functional.

6.4.6.3 ~~6.4.3.5.3~~ Issuance of Certificate of Final Occupancy.

6.4.6.3.1 ~~6.4.3.5.4~~ To obtain a Certificate of Final Occupancy, the ~~Facility Coordinator/Facility Safety Head~~FC/FSH/Project Manager shall notify the LaRC AHJ that all technical deficiencies identified by the inspection ~~(that was~~and part of the issuance of the Certificate of Beneficial Occupancy~~)~~ have been corrected.

6.4.6.3.2 ~~6.4.3.5.5~~ The LaRC AHJ and ~~SFAB Head~~SMAO Director (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.

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

~~6.4.4 RESPONSIBILITIES~~

6.4.7 ~~6.4.4.1~~ RESPONSIBILITIES

6.4.7.1 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 the initiation of facility 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.

6.4.7.2 ~~6.4.4.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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.

6.4.7.3 ~~6.4.4.3~~ LaRC AHJ shall:

a. Review all proposed facility 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~~."~~".

7. FIRE PROTECTION

7.1 SMOKING REGULATIONS

7.1.1 PURPOSE

This Section reinforces the LaRC Smoking Policy and Regulations.

~~7.1.1~~7.1.2 ~~7.1.2~~ SCOPE

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

~~7.1.2~~7.1.3 ~~7.1.3~~ REQUIREMENTS

7.1.3.1 ~~7.1.3.1~~ Smoking shall be permitted only in designated smoking areas.

7.1.3.2 ~~7.1.3.2~~ Adequate receptacles shall be provided in designated smoking areas 25 feet away from the facility.

a. ~~a.~~ All smoking materials must be discarded in approved receptacles.
b. ~~b.~~ Smoking receptacle waste shall be collected and removed as per NFPA 101.

7.1.3.3 ~~7.1.3.3~~ Electronic smoking devices shall follow the same ~~conditions~~requirements as traditional smoking materials.

7.1.3.4 ~~7.1.3.4~~ Lighters, matches, or other flame-producing devices shall be used only as intended.

a. ~~a.~~ Carrying/using “strike anywhere” matches shall be prohibited at LaRC.
b. ~~b.~~ Safety matches shall be permitted.

~~7.1.3~~7.1.4 ~~7.1.4~~ RESPONSIBILITIES

~~7.1.4.1~~ The Safety and Mission Assurance Office ~~of Human Capital Management~~(SMAO) shall administer LAPD 1820.1, “Smoking Control Program~~.~~”.

~~7.2 FIRE LANES~~

~~7.2.1 PURPOSE~~

7.2 ~~7.2.1.1~~ FIRE LANES

7.2.1 PURPOSE

This Section establishes general design and operating ~~practices~~ requirements to ensure facility accessibility for firefighting forces.

7.2.2 ~~7.2.2~~ SCOPE

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

7.2.3 ~~7.2.3~~ REQUIREMENTS

7.2.3.1 ~~7.2.3.1~~ General

7.2.3.1.1 ~~7.2.3.1.1~~ Provisions for facility fire lane accessibility in new facilities or existing facility modifications or additions shall comply with the design criteria contained herein.

7.2.3.1.2 ~~7.2.3.1.2~~ The ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall notify the LaRC AHJ prior to facility configuration alteration to review and approve ~~the~~any potential fire lane impairments and to allow the LaRC Fire Department to update its pre-fire plan.

7.2.3.2 ~~7.2.3.2~~ Fire Lanes

7.2.3.2.1 ~~7.2.3.2.1~~ Fire lanes shall be provided ~~to~~ within 50 feet of at least 50 percent of the perimeter of the facility or as otherwise determined by the AHJ.

a. ~~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~~2 provides an illustration of ~~the~~ approved turnarounds configurations.
b. ~~b.~~ Fire lanes and building access for emergency response vehicles and personnel shall not be obstructed by trees, vegetation, ~~or other exterior~~ decorations security barricades, maintenance vehicles, waste collection containers, etc.

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

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

7.2.3.2.4 ~~7.2.3.2.4~~ Access roads shall be ~~furnished by application~~constructed 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~~ lbs. live vehicle load). ~~Access roads shall also have a minimum of 13 feet 6 inches of vertical clearance.~~

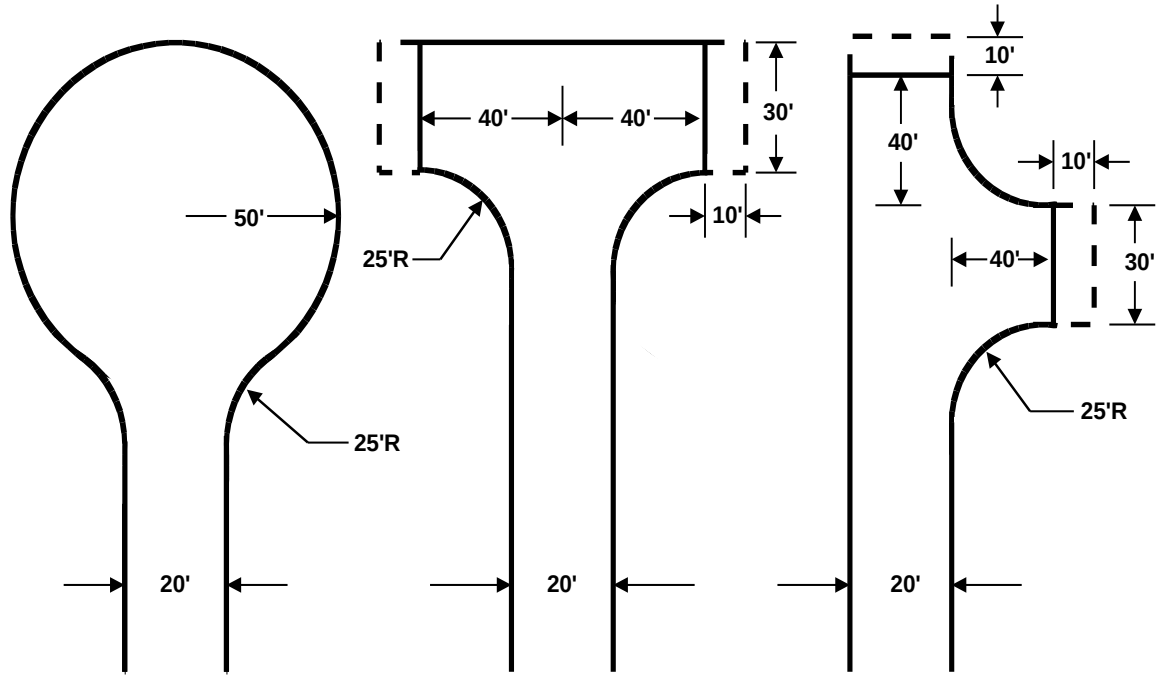
7.2.3.2.5 Access roads shall also have a minimum of 13 feet 6 inches ~~of~~ vertical clearance.

7.2.3.2.6 ~~7.2.3.2.5~~ Fire lanes shall be marked with freestanding signs ~~or~~ and marked curbs~~, sidewalks, or other traffic surfaces~~ with the words “FIRE LANE ~~–~~ NO PARKING” painted in black letters on a yellow background.

7.2.4 ~~7.2.4~~ RESPONSIBILITIES

7.2.4.1 ~~7.2.4.1. Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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.



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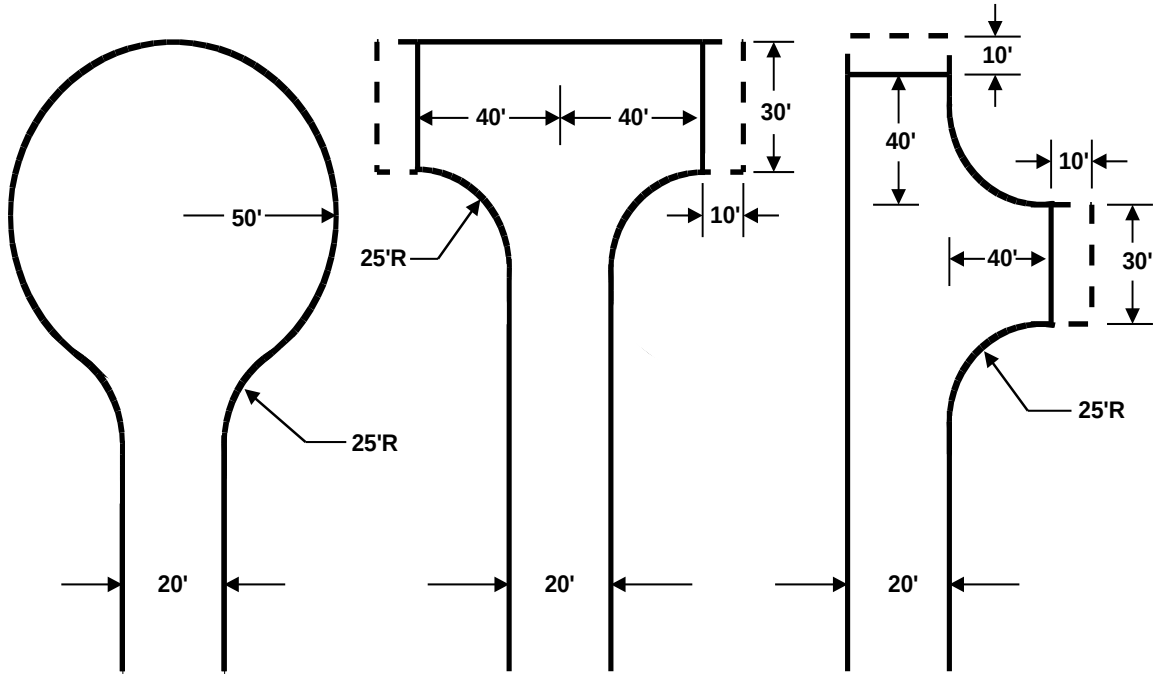

~~A~~ ~~B~~ ~~C~~

7.2.4.2 ~~7.2.4.2~~ Figure 7.2~~1~~, "Approved Fire Lane Turnarounds~~.~~"

7.2.4.3 ~~7.2.4.3~~ Cul-de-sacs ~~with~~shall have a minimum 50-foot unobstructed radius ~~and~~, or a 30-foot by 80-foot "T" section ~~of~~, or a "Hammerhead" turn around~~, provided that~~ as depicted in Figure 7.2. Should a "T" section turnaround be selected, it must include 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~~above grade level.

7.2.4.4 ~~7.2.4.4~~ Bollards, security fences, and similar means employed to ~~prevent~~unauthorized exterior vehicular access to facilities shall be reviewed and approved by the AHJ.

~~7.3 HOT WORK/OPEN FLAME AND WELDING PERMIT SYSTEM~~

~~7.3.1 PURPOSE~~

7.3 ~~7.3.1.1~~ HOT WORK/OPEN FLAME AND WELDING PERMIT SYSTEM

7.3.1 PURPOSE

This Section establishes fire protection requirements for work or activities which ~~require~~ involve 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.

~~7.3.1~~7.3.2 ~~7.3.2~~ SCOPE

7.3.2.1 ~~7.3.2.1~~ This Section shall apply to all organizations at LaRC, as well as~~,~~ to all contractors that operate at LaRC.

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

~~7.3.2~~7.3.3 ~~7.3.3~~ REQUIREMENTS

7.3.3.1 ~~7.3.3.1~~ General Precautions

7.3.3.1.1 ~~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 or finish.
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 heat conduction.
d. Metal partitions, walls, ceilings, or roofs.

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

7.3.3.1.3 ~~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 ~~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 ~~7.3.3.2~~ Hot Work Requirements

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

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

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

7.3.3.2.3 ~~7.3.3.2.3~~ Automatic sprinkler protection shall be in service where provided.

~~7.3.3.2.5~~7.3.3.2.4 ~~7.3.3.2.4~~ Portable fire extinguishers shall be available for fire watch use.

a. ~~a.~~ Facility fire extinguishers shall not be used to satisfy this requirement.
b. ~~b.~~ Extinguishers shall be a minimum 10 ~~-~~lb~~s~~. ABC multipurpose dry chemical type.

~~7.3.3.2.6~~7.3.3.2.5 ~~7.3.3.2.5~~ Flammable liquids within 35 feet of the hot work area shall be removed.

~~7.3.3.2.7~~7.3.3.2.6 ~~7.3.3.2.6~~ Oily deposits within 35 feet of the hot work area shall be cleaned/removed.

~~7.3.3.2.8~~7.3.3.2.7 ~~7.3.3.2.7~~ Combustible materials within 35 feet of the hot work area shall be removed.

~~7.3.3.2.9~~7.3.3.2.8 ~~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.

~~7.3.3.2.10~~7.3.3.2.9 ~~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.

~~7.3.3.2.11~~7.3.3.2.10 ~~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.

~~7.3.3.2.12~~7.3.3.2.11 ~~7.3.3.2.11~~ Special precautions shall be taken to avoid unwanted activation of automatic detection or suppression systems due to the use of hot work equipment. This includes impairment of the smoke detectors in the work area through the correct fire protection impairment protocol as outlined in Section 5.1.

7.3.3.3 ~~7.3.3.3~~ Fire Watch Requirements for Hot Work Activities

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

7.3.3.3.2 ~~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. ~~a.~~ Multiple fire watchers shall be provided in circumstances where a single fire watch cannot see all hazards created by hot work operations including the hot work operator.
b. ~~b.~~ All clothing shall be approved by standard welding practices.

7.3.3.3.3 ~~7.3.3.3.3~~ The fire watch shall know where the nearest emergency pull station is~~,~~ if provided, and ~~shall~~ have a means to report an emergency to the LaRC SSCC ~~.~~

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

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

7.3.3.3.6 ~~7.3.3.3.5~~ The fire watch shall not have any other collateral duties.

7.3.3.3.7 ~~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 end of hot work operation.

7.3.3.3.8 ~~7.3.3.3.7~~ The fire watch shall ensure required smoke detectors are taken in and out of service each day.

7.3.3.4 ~~7.3.3.4~~ Shop Welding and Cutting Areas

7.3.3.4.1 ~~7.3.3.4.1~~ Shops ~~that perform~~and shop locations where hot work activities are performed shall be approved by the LaRC AHJ.

7.3.3.4.2 ~~7.3.3.4.2~~ The permitted hot work area shall comply with the following~~.~~ :

a. ~~a.~~ If provided, hot work activities shall not be ~~permitted~~allowed while sprinkler protection is out of service, unless approved by the LaRC AHJ.
b. ~~b.~~ The ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall notify the LaRC AHJ of any impairments to the automatic sprinkler system within the shop area.
c. ~~c.~~ Hot work permit shall be posted and remain visible at all times.
d. ~~d.~~ Conduct hot work in accordance with the permit requirements.

7.3.3.4.3 ~~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 for at least 35 feet in any direction in which sparks may travel.

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

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

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

7.3.3.4.6 ~~7.3.3.4.6~~ Gas cylinder requirement for gas welders and torches.

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

~~c.~~b. ~~(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*.

7.3.3.4.7 ~~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.
7.3.3.4.7.1 ~~a.~~ Shop permits shall be written for a period not to exceed 1 year.

7.3.3.4.8 ~~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.

7.3.3.4.9 ~~7.3.3.4.10~~ A fire watch shall be required under specific circumstances in approved fixed hot ~~work shops or~~workshops for areas at the discretion of the shop/area supervisor or the LaRC AHJ.

~~7.3.3~~7.3.4 ~~7.3.4~~ RESPONSIBILITIES

7.3.4.1 ~~7.3.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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~~workshop areas have current permits posted as outlined in the standard.

7.3.4.2 ~~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~~establish practices and compensatory measures to prevent fires or explosions related to a specific hot work activit~~ies~~y.

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

7.4 HEAT-PRODUCING APPLIANCES

7.4.1 PURPOSE

This Section establishes the requirements for ~~heating~~heat-producing appliances.

~~7.4.1~~7.4.2 ~~7.4.2~~ SCOPE

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

~~7.4.2~~7.4.3 ~~7.4.3~~ REQUIREMENTS

7.4.3.1 ~~7.4.3.1~~ General Requirements

7.4.3.1.1 ~~7.4.3.1.1~~ Heat-producing appliances shall not be used on or near combustible surfaces unless provided with adequate insulation. Appliances shall be set up according to manufacturer specifications.

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

a. ~~a.~~ Heat producing appliances shall be disconnected from their power source when not in use.
b. ~~b.~~ Portable heaters shall be automatically de-energized by an approved switch when tilted or tipped over.

7.4.3.1.3 ~~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 ~~7.4.3.1.4~~ Coffee makers and similar appliances shall be UL Listed~~,~~ and installed so that they are in plain view.

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

7.4.3.1.5 ~~7.4.3.1.5~~ Heaters using gasoline (or other Class I Flammable and Class II Combustible liquids) shall be strictly prohibited in any indoor location (see National Fire Protection Association ~~[~~(NFPA~~]~~) 30 for definitions).

7.4.3.1.6 ~~7.4.3.1.6~~ Combustible liquids used for refueling shall be stored in steel safety cans of appropriate color that are UL Listed and have spring loaded self-closing lid.

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

7.4.3.2 ~~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.
i. Asphalt and tar kettles or similar fired equipment for preparing hot substances shall be located in a safe place outside the building at a point where there is no danger of ignition of combustible materials.
j. Continuous supervision by the user shall be maintained while such equipment is in operation.
k. Each tar kettle shall be provided with a metal cover and an accurate thermometer or other gage located in full view of the operator.
l. Tar kettles shall be operated at temperatures at least 25 degrees below the ignition point of the material being used.
m. Two 4A:60BC rated multi-purpose dry chemical fire extinguishers shall be provided and maintained within 25 feet of each tar kettle.
n. Tar kettles shall be located a minimum of 20 feet from a facility or shall be protected from the facility by a barrier standing 4 feet above and to both sides of the pot.
o. Rope barriers shall be provided to keep ~~unrelated~~unauthorized personnel 20 feet from the tar kettle.
p. The Contractor shall verify that the lid will close tight and that the ~~tar~~ kettle will be constantly attended from 30 minutes prior to operations until 30 minutes ~~beyond~~after kettle burners have been shut off.
q. All personnel on the roof during torch application shall be trained on the proper use of a fire extinguisher.
r. At least two 2~~½~~ 1/2 gallon containers of water and two 20-pound ABC ~~(~~dry chemical~~)~~ fire extinguishers shall be available within 10 feet of torch operations, per torch for use ~~during~~ by the fire watch.
s. Fire watch personnel shall be provided during torch application and for two hours after completion of torch application.
~~.~~ At least one calibrated infrared heat detection gun per torch shall be provided for use during the fire watch to verify ~~cool, safe, and a non~~ that ignition of combustible ~~conditions exist.~~
~~u.~~t. material has not occurred. For at least 2 hours, properly trained fire watch personnel ~~properly trained~~ shall be provided to survey the underside of the roof deck

(whenever possible), as well as the topside for possible smoldering ~~elements~~combustion.

~~v.~~u. All fire extinguishers shall be examined to make sure they are full and operable prior to the start of the day's work.

~~w.~~v. Steel or other noncombustible scaffolding, shoring, and forms are recommended, where practical.

~~x.~~w. Use of LPG shall be in accordance with ~~NFPA58~~NFPA 58.

7.4.3.3 ~~7.4.3.3~~ Space Heaters

7.4.3.3.1 ~~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.

7.4.3.3.1.1 ~~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.~~SMAO

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

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

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

a. ~~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.~~

~~7.4.3.7~~7.4.3.4 ~~7.4.3.4~~ Heater Fuel Supply and Storage

7.4.3.4.1 ~~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. ~~a.~~ Fuel lines shall be protected against mechanical damage.
b. ~~b.~~ Fuel lines shall be visually inspected ~~daily.~~.

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

a. ~~a.~~ "No Smoking" labels shall be placed on it~~h~~em.

b. ~~b.~~ Barricades shall be placed around them~~.~~ where there is a possibility of vehicular impact.
c. ~~c.~~ Such tanks shall meet the requirements of NFPA 30 ~~or~~ and NFPA 31 as applicable.

7.4.3.4.3 ~~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 in accordance with NFPA 58.

7.4.3.4.4 ~~7.4.3.4.4~~ LPG supply tanks equal to or greater than ~~a125~~a 125-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.~~
~~7.4.3.4.4.2~~7.4.3.4.4.1 ~~a.~~ Such units shall be shut down and cooled before being refueled or moved.

~~7.4.3.8~~7.4.3.5 ~~7.4.3.5~~ Temporary Portable Electric Heaters

7.4.3.5.1 ~~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.~~
a. The NASA Energy Manager shall investigate ways to improve the central heating distribution.
b. If, as a final solution, a portable heater is necessary in an area, the Energy Manager and AHJ shall approve the use of a portable heater if the conditions of 7.4.3.5.2 are met.

7.4.3.5.2 ~~7.4.3.5.2~~ Approved temporary portable heaters shall comply with the following procedures:

a. Approval for use shall be obtained from the AHJ, Energy Manager, and cognizant ~~Facility Coordinator/Facility Safety Head~~FC/FSH.
b. The heater shall be ~~approved~~listed by a nationally recognized testing/certification laboratory such as UL.
c. Only oil-filled portable electric heaters not exceeding 1800 watts will be approved.
d. Due to the additional electrical load, the proposed heater usage shall be reviewed by an electrician to verify that the circuit ~~is~~ would not be overloaded. Some facilities have specific electrical load restrictions which shall be adhered to.
e. The location of the unit shall be considered.
f. 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.
g. Administrative controls shall be implemented to ensure the unit is turned off and unplugged when space being heated is unoccupied.

~~7.4.3~~7.4.4~~7.4.4~~ **RESPONSIBILITIES**

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

7.4.4.2 ~~7.4.4.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall not allow the use of portable heaters without approval from the LaRC AHJ.

~~7.5 FIRE PROTECTION DURING CONSTRUCTION~~

~~7.5.1 PURPOSE~~

7.5 FIRE PROTECTION DURING CONSTRUCTION

7.5.1 PURPOSE

This Section prescribes minimum fire protection safeguards for construction and demolition activities, including alterations and ~~demolition~~rehabilitations.

~~7.5.1~~7.5.2 ~~7.5.2~~ **SCOPE**

~~7.5.2.1~~ This Section shall apply to all construction and demolition activities at LaRC.

~~7.5.2~~7.5.3 ~~7.5.3~~ **REQUIREMENTS**

7.5.3.1 ~~7.5.3.1~~ Preconstruction Safety Briefing

7.5.3.1.1 ~~7.5.3.1.1~~ A preconstruction Safety Briefing shall be held prior to the initiation of construction and demolition activities~~.~~:

a. ~~a.~~ This briefing shall ~~pass along~~include fire/life safety-related issues and requirements.
b. ~~b.~~ Construction Safety Briefing ~~is given to~~must be attended by Contractors before they can begin work.

7.5.3.1.2 ~~7.5.3.1.2~~ Items to be discussed in the preconstruction briefing shall include:

a. Emergency and business telephone numbers for the LaRC Fire Department.
b. Requirements for construction to include 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~~not to exceed 5 gallons ~~or less shall~~may be transported, though only in approved steel safety containers.
2) No bulk storage of flammable liquids shall be permitted without LaRC AHJ prior approval.

g. Requirements for accumulation of combustibles, form lumber, forms, waste, and debris.
h. Use of temporary heating equipment.
i. Other items pertaining to fire protection/prevention/life safety/permitting needed for the specific job.

7.5.3.2 ~~7.5.3.2~~ Safety Plan

7.5.3.2.1 ~~7.5.3.2.1~~ The plan shall include full compliance with requirements set forth ~~in~~at by NFPA 241 as well as the following:

a. Good housekeeping practices shall be observed in accordance with Section 7.~~9~~8 of this document.
b. Installation of new fire protection systems as construction progresses.
c. Preservation of existing fire protection systems during demolition.
d. Rapid notification of fires in accordance with Section 7.~~10~~9 of this document.
e. Consideration of special hazards resulting from previous operations:
   1) Any cutting, welding, or other types of hot work at construction sites shall comply with Section 7.3 of this document.
   2) The storage of flammable compressed gases at construction sites ~~complies~~shall comply with Section 8.3 of this document.

7.5.3.3 ~~7.5.3.3~~ Buildings under construction shall comply with NFPA 1, NFPA 241, OSHA requirements, local codes, ~~and~~NASA-specific criteria, NASA AHJ requirements and the general conditions of the specifications.

7.5.3.3.1 ~~7.5.3.3.1~~ When the work requires the temporary removal of the protection provided by an installed fire protection system, the work shall be programmed to limit the outage to the absolute minimum time, and to ~~a~~en~~s~~sure that all practical precautions are taken, in the form of substitute protection and rescheduling of hazardous “hot work” until protection is restored. Final determination as to what is deemed acceptable precautions is the sole responsibility of the NASA AHJ.

7.5.3.3.2 ~~7.5.3.3.2~~ Contractors shall not shut down, shut off, disconnect, block~~,~~ or otherwise impair any fire protection ~~sprinkler~~/suppression system, fire hydrant, fire alarm system~~, special extinguishing,~~ or ~~other installed fire protection~~component thereof, gas detection system, AED, emergency lighting, exit signage, emergency power, or safety interlock without prior ~~authority~~approval in writing from the AHJ.

7.5.3.3.3 ~~7.5.3.3.3~~ All temporary space ~~heating installations~~ heaters utilized during construction / demolition activities shall comply with the following requirements:

a. ~~7.5.3.3.4~~ No liquid fuel tanks shall be pressurized except liquefied petroleum (LPG) in approved containers.

~~d.~~b. ~~7.5.3.3.5~~ To prevent fuel box explosions, liquid and gas burning units shall be provided with appropriate safeguards properly designed for the size and fuel rate of the equipment. For example, all gas or liquefied petroleum gas-heating units shall be equipped with safety pilots.

~~f.~~c. ~~7.5.3.3.6~~ Liquid and gas-fired units shall be shut down and cooled prior to ~~for~~ refueling.

~~h.~~d. ~~7.5.3.3.7~~ Solid fuel-burning equipment shall be completely enclosed and vented to the outside.

~~j.~~e. ~~7.5.3.3.8~~ Adequate clearance shall be maintained to prevent ignition of combustible materials. Utilize manufacturer's instructions and any applicable codes to ensure full compliance.

~~l.~~f. ~~7.5.3.3.9~~ Gasoline-powered air compressors, hoists, derricks, or pumps shall be located so that the exhaust is well away from combustible material and exhaust vapors are piped outside, away from air intakes or otherwise adequately dispersed.

~~n.~~g. ~~7.5.3.3.10~~ When additions or major alterations are undertaken in occupied buildings, a barrier shall be erected to separate the construction areas from the remainder of the building. Specific barrier location is under the sole discretion of the NASA AHJ.

~~p.~~h. ~~7.5.3.3.11~~ This barrier shall be of noncombustible construction hav~~ing~~e a fire-resistance rating equivalent to that of the existing facility.

7.5.3.3.4 ~~7.5.3.3.12~~ Emergency exits shall be maintained during construction operations.

a. ~~7.5.3.3.13~~ In the construction of new ~~multistory~~multi-story buildings, at least one usable stairway (or ramp) shall be provided and readily available for use at all times.

~~c.~~b. ~~7.5.3.3.14~~ The stairway shall be extended upwards as each floor level is erected during rehabilitation of/or modifications to existing buildings.

~~e.~~c. ~~7.5.3.3.15~~ If normal paths of exit travel are blocked by construction, clearly defined and illuminated alternate exits shall be provided. Prior approval of exiting configuration must be obtained from the NASA AHJ.

~~g.~~d. ~~7.5.3.3.16~~ The Contractor shall conduct or have conducted an inspection of the entire work area at the end of each workday to ~~discover~~check for any smoldering or incipient fires and to ~~remove~~mitigate any hazardous conditions.

7.5.3.3.5 ~~7.5.3.3.17 Fire Planning~~ Pre-fire planning – the Contractor shall prepare for necessary action in ~~case~~the event of a fire.

7.5.4 ~~7.5.4~~ RESPONSIBILITIES

~~7.5.4.1~~ The LaRC Fire Chief or Designee shall~~:~~
~~Answer~~ respond to questions relative to fire protection/prevention asked by ~~construction~~ Contractor.

7.5.4.1 ~~7.5.4.2~~ Construction Safety Inspector shall:

a. Enforce the construction fire safety plan with assistance from the LaRC AHJ (or Designee).
b. Discuss fire protection and prevention policies ~~with~~and construction with Contractor.
~~a. 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~~
7.6 STANDARD FIRE SYMBOLS FOR LARC

7.6.1 PURPOSE

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 also to identify outside fire protection equipment locations.

~~7.6.1~~7.6.2 ~~7.6.2~~ SCOPE

~~7.6.2.1~~ This Section shall apply to all facilities / areas at LaRC.

~~7.6.2~~7.6.3 ~~7.6.3~~ REQUIREMENTS

7.6.3.1 ~~7.6.3.1~~ General

a. ~~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.~~

b. Section 7.6.3.2.

7.6.3.2 NFPA 704 Posting

7.6.3.2.1 ~~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.~~:

a. ~~7.6.3.2.2~~ The left-hand diamond represents the health hazard of the material.
b. The top diamond represents the flammability hazard of the material.
c. The right-hand diamond represents the reactivity hazard of the material.
d. The bottom diamond provides special information relative to the material such as reactivity to water.

7.6.3.2.2 Each of the four diamonds of the main symbol shall be color coded~~.~~ as follows:

a. ~~a.~~ The background color of the diamond representing the health hazard shall be BLUE.
b. ~~b.~~ The background color of the diamond representing the flammability hazard shall be RED.
c. ~~c.~~ The background color of the diamond representing the reactivity hazard shall be YELLOW.
d. ~~d.~~ The background color ~~for~~of the diamond providing special information shall be WHITE.

7.6.3.2.3 ~~7.6.3.2.3~~ Each hazard category shall be assigned a hazard classification based on the physical properties of the material.

7.6.3.2.4 Table 7.~~1~~6 lists the five classifications of hazards and the general meaning to fire fighters.

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

7.6.3.2.6 ~~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.

7.6.3.2.7 ~~7.6.3.2.5~~ The color of each number representing the hazard classification shall be black.

7.6.3.2.8 ~~7.6.3.2.6~~ NFPA 704 numbers can be obtained on applicable Safety Data Sheet (SDS).

~~7.6.3.2.8~~7.6.3.2.9 The size and location of ~~the~~ diamond signage shall be established by the AHJ.

7.6.3.3 ~~7.6.3.3~~ Table 7.~~1~~6, Degrees of Hazards

DEGREE OF HAZARD	HAZARD INVOLVED
4	Fire is too dangerous to approach with standard firefighting 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 firefighting procedures can be used.
0	No special hazards are present.

~~7.7 CONTROL OF COMBUSTIBLES~~

~~7.7.1 PURPOSE~~

~~7.7.1.1~~
7.7 CONTROL OF COMBUSTIBLES

7.7.1 PURPOSE

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

~~7.7.1~~7.7.2 ~~7.7.2~~ SCOPE

~~7.7.2.1~~ These controls and protection philosophies shall apply to all LaRC facilities and areas.

~~7.7.2~~7.7.3 ~~7.7.3~~ REQUIREMENTS

7.7.3.1 ~~7.7.3.1~~ General

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

7.7.3.2 ~~7.7.3.2~~ Normal Combustibles

7.7.3.2.1 ~~7.7.3.2.1~~ The location of TFLs shall be restricted to minimize potential fire hazard exposures to LaRC facilities~~.~~ as follows:

a. ~~a.~~ TFLs shall not be positioned within 6 feet of a fire door, measured perpendicularly.
b. ~~b.~~ TFLs shall not be positioned within 6 feet of a fire barrier.
c. ~~c.~~ TFLs shall not be located in electrical equipment rooms.
d. ~~d.~~ TFLs shall not be located in stairwells or corridors.
e. ~~e.~~ TFLs shall not be obstruct means of egress.
f. ~~f.~~ TFLs (trash dumpsters) shall be kept a minimum of 25 feet~~.~~ from LaRC facilities.

7.7.3.2.2 ~~7.7.3.2.2~~ The LaRC AHJ shall ensure that the total transient and permanent fire loading does not exceed the capabilities of the installed fire protection systems and equipment ~~as identified by the LaRC AHJ.~~ .

a. ~~a.~~ Where there is a heavy concentration of equipment protected by fixed fire protection systems intended for ~~those~~ specific hazards, no credit shall be ~~taken~~given for those systems ~~to provide~~in providing extinguishment capability for the TFLs.
b. ~~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. NASA AHJ shall determine whether protection is adequate.

~~7.7.3.2.4~~7.7.3.2.3 ~~7.7.3.2.4~~ Equipment located in areas that require~~s~~ periodic replenishment ~~with~~of 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 when removed, shall be taken to a suitable outdoor location for storage or disposal.

~~7.7.3.2.5~~7.7.3.2.4 ~~7.7.3.2.5~~ Waste, debris, scrap, rags, oil, spills~~,~~ or other combustibles resulting from ~~the~~ work activity shall be removed ~~from areas,~~ and ~~shall be~~ taken to a suitable outdoor location for storage or disposal~~,~~ following the completion of ~~the~~ activity~~,~~ or at the end of each work shift, whichever is sooner. These requirements supersede environmental regulations directing that hazardous waste remain inside facility.

~~7.7.3.2.6~~7.7.3.2.5 ~~7.7.3.2.6~~ Waste paper, dirty dress out gear, and other trash which has been bagged for removal shall not be left indoors to accumulate.

a. This material shall be removed or placed in an approved storage location and container at the end of each shift.

b. Storage locations shall be approved by the LaRC AHJ in accordance with the controls of this Section.

~~7.7.3.2.7~~7.7.3.2.6 ~~7.7.3.2.7~~ The use of welding/burning equipment shall be in accordance with Section 7.3 of this document.

~~7.7.3.2.8~~7.7.3.2.7 ~~7.7.3.2.9~~ Gasoline, liquefied petroleum gas (LPG), electric, or diesel operated vehicles that enter any facility shall ~~have met~~comply with the requirements of this Section.

~~a.~~

a. Provide proper ventilation for the exhaust of hazardous gases.
b. ~~b.~~Charging stations for ~~these~~ vehicles shall be in compliance with NFPA 505.
c. ~~c.~~Proper ventilation shall be provided for charging stations.
d. ~~d.~~Proper exterior storage of spare and empty LPG tanks shall be provided in compliance with NFPA 58.

~~7.7.3.2.9~~7.7.3.2.8 ~~7.7.3.2.10~~ Insulation on high-temperature casings or pipes that become soaked or suspected of ~~being~~having been soaked with combustible liquids shall be replaced as soon as possible.

~~*Note:*~~
7.7.3.2.8.1 Cleanup of all spills and elimination of all leaks that might soak insulation on high-temperature casings or pipes shall be undertaken immediately.

NOTE: *Generally, combustible liquids have an auto ignition temperature of 1150~~°~~ degrees F, but when soaked into insulation, this fluid will ignite at temperatures as low as 600~~°~~ degrees F.*

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

~~7.7.3.2.12~~7.7.3.2.9 ~~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.

7.7.3.3 ~~7.7.3.3~~ Flammable/combustible liquids shall meet the requirements of Section 8.2 of this document.

7.7.3.4 ~~7.7.3.4~~ Compressed gas cylinders containing flammable gases shall meet the requirements of Section 8.3 of this document.

7.7.3.5 ~~7.7.3.5~~ Building Materials

7.7.3.5.1 ~~7.7.3.5.1~~ Fire retardant~~,~~ or pressure ~~t~~-treated lumber and any other ~~related~~ combustible materials that are to be used in any area of LaRC shall be approved by LaRC AHJ. Exception: Minor quantities of combustible wood trim moldings.

~~7.8 HOUSEKEEPING PRACTICES TO MINIMIZE FIRE LOSS~~

~~7.8.1 PURPOSE~~

7.8 ~~7.8.1.1~~ HOUSEKEEPING PRACTICES TO MINIMIZE FIRE LOSS

7.8.1 PURPOSE

This Section establishes good housekeeping practices to minimize the risk ~~of~~to life and property ~~losses from~~by fire.

~~7.8.1~~7.8.2 ~~7.8.2~~ SCOPE

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

~~7.8.2~~7.8.3 ~~7.8.3~~ REQUIREMENTS

7.8.3.1 ~~7.8.3.1~~ General

7.8.3.1.1 ~~7.8.3.1.1~~Every LaRC facility shall have a housekeeping program. 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 ~~7.8.3.1.2~~ The housekeeping program shall include, but is not limited to the following:

a. Control of operating supplies and wastes to limit quantities to minimum necessary.
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 ~~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 ~~7.8.3.1.4 Each facility shall be inspected by the Facility Safety Head~~The FSH to ensure general housekeeping practices are met by practicing the following requirements~~.~~:

a. ~~7.8.3.2~~ Storage and Removal of Rubbish (Trash)

~~2)~~1) ~~7.8.3.2.1~~ Approved trash receptacles/containers shall be provided for rubbish.

4)2) 7.8.3.2.2 Trash carts shall have the doors closed when not in use.

6)3) 7.8.3.2.3 Trash carts shall be emptied into dumpsters before overflowing.

8)4) 7.8.3.2.4 Trash carts shall be staged in the areas approved and designated for these receptacles.

10)5) 7.8.3.2.5 Combustible wastes shall not be allowed to accumulate in the work bays, intest cells, or outside of waste receptacles.

12)6) 7.8.3.2.6 Trash cans and recycle containers shall not be stored in stairways.

14)7) 7.8.3.2.7 Bulk recycle/waste containers shall not be stored inside facilities.
***Exception**: Where otherwise approved by the LaRC AHJ.*

16)8) 7.8.3.2.8 Dumpsters distance from facilities, substations, and equipment shall comply with Section 7.7, NFPA and STD 8719.11.

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

1) 7.8.3.3.1 Exits and exit accesses shall be clear and unobstructed.

3)2) 7.8.3.3.2 Fire doors shall be kept clear of obstructions to ensure operation.

5)3) 7.8.3.3.3 Access to portable fire extinguishers, sprinkler system control valves, and manual actuation devices (pull stations) shall be clear and unobstructed.

7)4) 7.8.3.3.4 Equipment or stored materials shall not be located above an imaginary horizontal plane throughout thea room 18 inches below the bottom of a sprinkler head.

9)5) 7.8.3.3.5 Fire hydrants shall be accessible at all times, free of vegetation, vehicles, equipment, and other obstructions.

11)6) 7.8.3.3.6 Fire alarm control panels shall be clear and unobstructed at all times.

c. 7.8.3.4 Prevention of Excessive Combustible Loading

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

3)1) 7.8.3.4.2 Oily rags and mops shall be stored in noncombustible safety containers or outside of the facility.

5)2) 7.8.3.4.3 Areas between facilities shall be maintained so they are clear of combustible materials, such as stored lumber, wood pallets, rubbish, or vegetation.

7.8.3.5 Electrical equipment shall be maintained in compliance with NFPA, OSHA, and LPR ####

3) 7.8.31710.6.

d. Maintaining Smoking Areas:

1) 7.8.3.6.1 Outdoor smoking receptacles shall be properly maintained and emptied.

3)2) 7.8.3.6.2 Ash trays shall not be dumped into waste paper or trash receptacles:.

5)3) 7.8.3.6.3 Ash trays shall be emptied into a separate closed metal container daily.

7)4) 7.8.3.6.4 The dedicated ~~smoking metal~~ container shall be stored outside.

7.8.37.8.4 7.8.4 RESPONSIBILITIES

7.8.4.1 7.8.4.1 Facility CoordinatorFC and/or Facility Safety HeadFSH shall:

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

7.8.4.2 7.8.4.2 LaRC Fire Chief shall:

a. Report unsafe conditions to the Facility CoordinatorFC and/or Facility Safety HeadFSH.
b. Close facility or area if unsafe conditions cannot be immediately corrected.

7.9 FIRE NOTIFICATION/FACILITY EVACUATION

7.9.1 PURPOSE

7.9 7.9.1.1 FIRE NOTIFICATION / FACILITY EVACUATION

7.9.1 PURPOSE

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

~~7.9.1~~7.9.2 ~~7.9.2~~ SCOPE

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

~~7.9.2~~7.9.3 ~~7.9.3~~ REQUIREMENTS

7.9.3.1 ~~7.9.3.1~~ Any person observing a fire or other emergency shall promptly evacuate the affected area or facility as quickly as possible, and if possible, activat~~ing~~e a manual fire alarm pull station on the way outside should the fire alarm not already be sounding. Once safely outside of the facility, the employee shall call 757-864-2222 to ~~confirm notification of~~report the fire or emergency. ***Exception***: *For workplace violence, do not pull fire alarm manual pull station.*

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

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

7.9.3.3 ~~7.9.3.3~~ If ~~the~~a fire is in its incipient stage, an employee may 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 ~~7.9.3.4~~ All personnel shall proceed to the safest and most convenient muster point assigned for that facility, standing by for further instructions. Muster Points are designated on facility evacuation plans.

7.9.3.5 ~~7.9.3.5~~ Once at ~~your~~the muster point and safe, someone in your group shall promptly call 911 or call 757-864-222~~2~~ from a cell phone to relay the following type of information:

a. Exact location of fire or emergency.
b. Type of fire or emergency (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.
e. Name of individual reporting fire or explosion.
f. Any other pertinent information requested by the dispatcher.
   1) Phone number
   2) Personnel requiring assistance with evacuation.

7.9.3.6 ~~7.9.3.6~~ The buddy system shall be utilized to assist physically challenged personnel (whether temporary or perm~~i~~anent) in exiting the facility/area during practice and real evacuations.

7.9.3.6.1 A person of adequate strength shall be assigned (by FSH/FC) to each physically challenged employee to assist in their evacuation.

7.9.3.6.2 Responding emergency forces shall be notified if physically challenged personnel require assistance with evacuation. ~~Some NASA LaRC facilities have ADA Areas of Refuge.~~

7.9.3.6.3 Some NASA LaRC facilities have designated ADA Areas of Refuge. This area shall be used as a shelter in place location for mobility-challenged individuals and their escorts.

7.9.3.7 ~~7.9.3.7~~ All fire alarm testing, fire drills, and evacuation drills shall be coordinated in advance with the ~~Facility Coordinator~~FC and /or ~~Facility Safety Head.~~ FSH.

7.9.3.7.1 ~~a.~~ A person may be designated to monitor ~~the~~any secure area(s) when time does not permit for classified material to be placed in secure repositories (this applies only to fire drills/testing). During a real emergency ALL personnel shall leave the facility immediately regardless of any security concerns.

7.9.3.8 ~~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~~7.9.4 ~~7.9.4~~ RESPONSIBILITIES

7.9.4.1 ~~7.9.4.1~~ LaRC employees, subcontractors, and visitors shall:

a. Notify the LaRC Emergency ~~fire dispatcher~~Dispatch Office of any observed fire or emergency by dialing 911 from Center phone or 757-864-2222 from cell phone.
b. Know evacuation routes and muster point for facilities where normally assigned.
c. Contact ~~Facility Coordinator~~FC or ~~Facility Safety Head~~FSH for evacuation routes and muster point when working in areas different than normally assigned ~~location~~.

7.9.4.2 ~~7.9.4.2~~ LaRC Fire Chief shall:

a. Ensure quick responses to all fires or emergencies at LaRC.
b. Ensure familiarity w~~it~~hen facility layouts by conducting ~~preplans~~preplan inspections.
c. Schedule and conduct fire drills.
d. ~~Assess and~~ Approve all muster point locations.

7.9.4.3 ~~7.9.4.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Know the evacuation routes and all muster points 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 muster points.
   5) Location of Areas of Refuge.

   6) ~~c.~~ Any special hazards
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 ~~7.10.1.1~~ EMPLOYEE FIRE PROTECTION TRAINING

7.10.1 PURPOSE

This Section establishes the information, relative to the LaRC Fire Protection Program, to be included in general employee training.

~~7.10.1~~7.10.2 ~~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.

~~7.10.2~~7.10.3 ~~7.10.3~~ REQUIREMENTS

7.10.3.1 ~~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 emergencies at LaRC.
d. Emergency telephone numbers for reporting emergencies at LaRC.

7.10.3.2 ~~7.10.3.2~~ Employees who request fire extinguisher education by NASA Fire Protection shall ~~include the~~receive a discussion of the following topics: (Only if training is requested)

a. Different types of fire extinguishers available at LaRC.
b. Classes of fires.
c. Proper procedures if employee discovers a fire at LaRC.
d. Decision on when to attempt extinguishment or flee.
e. Proper extinguisher selection
~~d.~~f. How to use a portable fire extinguisher.

~~7.10.3~~7.10.4 ~~7.10.4~~ RESPONSIBILITIES

~~7.10.4.1~~ LaRC Fire Chief shall:

a. Review and revise training material as necessary.
b. Ensure that training sessions relative to fire protection are incorporated into employee training course.

~~7.11 FIRE PROTECTION IN FACILITY OPERATING PROCEDURES~~

~~7.11.1 PURPOSE~~

7.11 ~~7.11.1.1 If~~FIRE PROTECTION IN FACILITY OPERATING PROCEDURES

7.11.1 PURPOSE

Where fire and life safety requirements are incorporated into facility operating procedures, the requirements of this Section shall be complied with.

~~7.11.1~~7.11.2 ~~7.11.2~~ SCOPE

7.11.2.1 ~~7.11.2.1~~ This Section shall apply to all facility operating procedures which have fire protection and life safety requirements.

7.11.2.2 In some instances, these requirements may refer to other codes and standards. In those instances, these references shall be deemed compulsory.

~~7.11.2~~7.11.3 ~~7.11.3~~ REQUIREMENTS

7.11.3.1 ~~7.11.3.1~~ New or revised operating procedures shall include the applicable requirements of ~~these fire protection standards~~this document.

7.11.3.2 ~~7.11.3.2~~ New and revised operating procedures which affect fire and life safety issues shall be approved by the LaRC AHJ.

7.11.3.3 ~~7.11.3.3 SFAB Manager~~SMAO Director shall ensure that new operating procedures incorporate fire and life safety criteria.

~~CHAPTER 8~~

~~10.~~8.~~8.~~ FIRE HAZARD PROTECTION

8.1 ~~8.1~~ ELECTRICAL INSTALLATION IN HAZARDOUS LOCATIONS

8.1.1 ~~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 ~~8.1.2~~ SCOPE

~~8.1.2.1~~ This Section shall apply to the design, operational requirements, and responsibilities for explosion proof electrical installations.

8.1.3 ~~8.1.3~~ REQUIREMENTS

8.1.3.1 ~~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 ~~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.~~ could exist.

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

8.1.3.3 ~~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 ~~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 ~~8.1.3.5~~ No alterations or modifications shall be made to listed or approved equipment for hazardous locations.

a. ~~a.~~ If modifications are made, the equipment shall be void for use in a classified hazardous location.

b. ~~b.~~ Electrical wiring and equipment in these areas shall be approved by the LaRC ~~Standard Practice Engineer~~SPE for Electrical and the LaRC AHJ.

~~8.1.5~~8.1.4 ~~8.1.4~~ RESPONSIBILITIES

8.1.4.1 ~~8.1.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Ensure that practices delineated in this Section are followed.
b. Contact the ~~Standard Practice Engineer~~SPE for Electrical and LaRC AHJ prior to installation of new electrical systems and equipment or modification of existing electrical systems and equipment.

8.1.4.2 ~~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 ~~8.2~~ FLAMMABLE AND COMBUSTIBLE LIQUIDS

8.2.1 ~~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 ~~8.2.2~~ SCOPE

~~8.2.2.1~~ This Section shall apply to the civil servants, contractors, guests, and students using, handling, and storing flammable and combustible liquids at LaRC.

8.2.3 ~~8.2.3~~ REQUIREMENTS

8.2.3.1 ~~8.2.3.1~~ General

8.2.3.1.1 ~~8.2.3.1.1~~ Users of flammable/combustible liquids shall be familiar with their hazard classifications for the purpose of complying with this Section and NFPA 30.

8.2.3.1.2 ~~8.2.3.1.2~~ Laboratory users of flammable/combustible liquids shall be familiar with their hazard classifications for the purpose of complying with NFPA 45.

8.2.3.1.3 ~~8.2.3.1.3~~ All flammable and combustible liquid handling equipment and storage areas shall be labeled in accordance with Section 7.~~7~~6 of this document.

8.2.3.2 ~~8.2.3.2~~ Storage

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

8.2.3.2.2 ~~8.2.3.2.2~~ Flammable/combustible liquids storage shall provide for segregation and/or separation from incompatible materials.

8.2.3.2.3 ~~8.2.3.2.3~~ Flammable and combustible liquids shall not be stored in proximity to stair enclosures, corridors, aisles, or exits.

8.2.3.2.4 ~~8.2.3.2.4~~ 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, less packing materials (such as boxes), 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) If forced ventilation is to be used, design shall be approved by LaRC AHJ.
c. ~~c.~~ Storage of any type shall not be permitted on top of flammable storage cabinets.

8.2.3.2.5 ~~8.2.3.2.6~~ When storage quantities exceed amounts outlined above, the liquids shall be stored in dedicated flammable liquid rooms or other facilities complying with NFPA 30 and 29 CFR 1910.106.

8.2.3.2.6 ~~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.

8.2.3.2.6.1 All flammable materials or liquid unused at the end of the day or work shift shall be properly stored.

8.2.3.2.7 ~~8.2.3.2.8~~ Open containers of flammable liquids (Class I, Class ~~2~~II and Class ~~3B~~III) shall not be left out unattended and shall comply with 8.2.3.2.~~7~~8.

8.2.3.2.8 ~~8.2.3.2.9~~ Flammable liquids shall be in closed containers at all times when not in actual use.

a. ~~a.~~ Containers and drums which have previously contained flammable liquids shall have covers, caps, or bungs replaced immediately after emptying.
b. ~~b.~~ Bungs shall be replaced with pressure and vacuum relief vents once the sealed drum is opened.
c. ~~c.~~ Safety cans shall be steel and have self-closing caps and flame arrestor screens.

d. ~~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. ~~e.~~ Portable containers for storage of flammable liquids shall not exceed 5 gallons.

8.2.3.2.9 ~~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 ~~8.2.3.3~~ Transferring~~,~~ and Dispensing Flammable and Combustible Liquids

8.2.3.3.1 ~~8.2.3.3.1~~ When dispensing from drums, the drums shall be equipped with UL Listed or FM approved dispensing devices.

8.2.3.3.2 ~~8.2.3.3.2~~ Air pressure shall not be used on a drum, portable tank, or small container for transferring flammable and combustible liquids.

8.2.3.3.3 ~~8.2.3.3.3~~ Liquids shall be transferred to or from safety cans by means of a listed hand pump drawing through the top, or by gravity through an approved self-closing valve.

a. ~~a.~~ Hand-operated rotary pumps when UL-Listed for flammable liquids may be used.
b. ~~b.~~ Metal spring loaded valves and spout may be used.

8.2.3.3.4 ~~8.2.3.3.4~~ When dispensing or transferring flammable/combustible liquids, containers shall be bonded together and grounded to eliminate buildup of static electricity.

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

8.2.3.3.5 ~~8.2.3.3.5~~ 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.

8.2.3.3.6 ~~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 ~~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 ~~8.2.3.3.8~~ When mechanical ventilation is required by code, the following criteria shall be met:

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.

8.2.3.4 ~~8.2.3.4~~ Using or Transporting Flammable or Combustible Liquids~~.~~

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

a. ~~a.~~ The use of 1-gallon glass or plastic containers for storage of flammable liquids shall be prohibited except when authorized by the LaRC AHJ or designee.
b. ~~b. A~~ Small approved plastic ~~container shall be limited to 1 gallon when approved by the LaRC AHJ~~containers “squeeze bottles” are permitted for dispensing of small quantities of acetone or ~~designee~~other cleaning agent.
c. ~~c.~~ Class ~~IA~~1A and ~~IB~~1B liquids shall be permitted to be stored in glass or plastic containers of not more than 1 gallon, if ~~required~~necessary for liquid purity or to avoid excessive corrosion of metal containers.

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

8.2.3.4.3 ~~8.2.3.4.3~~ Flammable/combustible waste and liquid shall be stored in closed, metal containers for daily disposal. This requirement supersedes any environmental regulations that might conflict with this safety mandate.

8.2.4 ~~8.2.4~~ **RESPONSIBILITIES**

8.2.4.1 ~~8.2.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 ~~8.2.4.2~~ LaRC AHJ shall evaluate locations when 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 ~~8.3.1.1~~ SAFE STORAGE AND USE OF FLAMMABLE GASES

8.3.1 PURPOSE

This Section establishes the requirements for the use, storage, and handling of flammable ~~.~~ compressed gases at LaRC.

~~8.3.1~~8.3.2 ~~8.3.2~~ SCOPE

~~8.3.2.1~~ This Section shall apply to the storage, transportation, identification, handling and use of flammable ~~,~~ compressed gases at LaRC.

~~8.3.2~~8.3.3 ~~8.3.3~~ REQUIREMENTS

8.3.3.1 ~~8.3.3.1~~ Storage

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

8.3.3.1.2 ~~8.3.3.1.2~~ Compressed flammable gases shall be stored in established gas storage areas on the outside of ~~the~~ facilities. Storage areas design and location are to be preapproved by the LaRC AHJ.

8.3.3.1.3 ~~8.3.3.1.3~~ All flammable compressed gases ~~inside~~located indoors shall comply with the following~~.~~:

a. ~~a.~~ Flammable compressed gases connected to systems or equipment shall be deemed “In Use~~.~~” for the purpose of establishing code requirements.
b. ~~b.~~ The storage of ~~compressed~~ gas cylinders within facilities shall be limited to the quantity required for daily operations and shall comply with ~~the~~ NFPA standards.

8.3.3.1.4 ~~8.3.3.1.4~~ Gas cabinet design, placement, and venting shall ~~be per~~comply with NFPA 55 and International Fire Code or as otherwise required by the LaRC AHJ.

8.3.3.1.5 ~~8.3.3.1.5~~ Flammable and oxidizing compressed gas cylinders located outside shall be separated by 20 feet or a 5-foot high, 30-minute fire rated wall.

a. ~~a.~~ Where gases of different types are stored at the same location, cylinders shall be grouped by types of gas~~.~~ (flammable, inert, oxidizer)
b. ~~b.~~ Empty and full gas cylinders shall be segregated, and empty cylinders tagged “EMPTY~~.~~”.
c. ~~c.~~ “NO SMOKING” signs shall be posted around the storage or operational area.

8.3.3.2 ~~8.3.3.2~~ Operation

8.3.3.2.1 ~~8.3.3.2.1~~ Flammable ~~,~~ compressed gas cylinders shall not be exposed to temperatures above 125 degrees Fahrenheit and ~~are protected~~shielded from direct sun and weather elements.

8.3.3.2.2 ~~8.3.3.2.2~~ Flammable ~~,~~ 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.~~

~~8.3.3.2.5~~8.3.3.2.3 ~~8.3.3.2.3~~ At no time shall oxygen-acetylene torches be 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. ~~a.~~ 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 regulators.
b. ~~b.~~ Exception No. 2: Oxy-acetylene torches being used under a valid, active "hot work" permit at a non-fixed location ~~shall~~may be left assembled if properly supported and fitted with correct pressure regulator.

~~8.3.3.2.6~~8.3.3.2.4 ~~8.3.3.2.4~~ Flammable gas cylinders shall not be lifted by magnetic devices or by their protective caps.

a. ~~a.~~ Flammable gas cylinders shall not be secured to a cradle or platform.
b. ~~b.~~ Flammable gas cylinders shall never be dragged, dropped, or struck.

~~8.3.3.2.7~~8.3.3.2.5 ~~8.3.3.2.5~~ Flammable gas cylinders shall not come in contact with electrical circuits, open flames, or arcs.

~~8.3.3.2.8~~8.3.3.2.6 ~~8.3.3.2.6~~ Flammable gas cylinders shall not be used for any purpose other than compressed gas containment.

~~8.3.3.2.9~~8.3.3.2.7 ~~8.3.3.2.7~~ Gas from flammable gas cylinders shall not be used without approved reducing regulators. These regulators shall be UL-Listed for the specific flammable gas in use.

~~8.3.3.2.10~~8.3.3.2.8 ~~8.3.3.2.8~~ Connecting devices shall be free of oil, grease, and dirt and have threads corresponding to the cylinder valving.

~~8.3.3.2.11~~8.3.3.2.9 ~~8.3.3.2.10~~ Valves shall be closed when cylinders are transported, moved at sites, and connected for use.

~~8.3.3.2.12~~8.3.3.2.10 ~~8.3.3.2.11~~ Fuel systems being supplied by flammable compressed gases shall be equipped with an automatic closing, fail-safe ~~closed~~shutoff valve interlocked to control system.

~~8.3.3.2.13~~8.3.3.2.11 ~~8.3.3.2.12~~ 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.

~~8.3.3.2.13 All compressed gas manifolds shall be designed in accordance with the applicable NFPA standards.~~

~~8.3.3.2.16~~8.3.3.2.12 ~~8.3.3.2.14~~ The indoor storage of propane cylinders typically used for outdoor grilling purposes is strictly prohibited.

~~8.3.3~~8.3.4 ~~8.3.4~~ RESPONSIBILITIES

8.3.4.1 ~~8.3.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Ensure that practices delineated in this Section are followed.
b. Contact the LaRC AHJ prior to establishing new compressed gas storage areas or modifying existing compressed gas storage areas.

8.3.4.2 ~~8.3.4.2~~ LaRC AHJ shall, when requested, 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 ~~8.4.1.1~~ FIRE PROTECTION FOR PORTABLE STRUCTURES

8.4.1 PURPOSE

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

~~8.4.1~~8.4.2 ~~8.4.2~~ SCOPE

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

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

~~8.4.2~~8.4.3 ~~8.4.3~~ REQUIREMENTS

8.4.3.1 ~~8.4.3.1~~ Construction

8.4.3.1.1 ~~8.4.3.1.1~~ All trailers and ~~mobile home units~~modular structures shall meet the appropriate construction, mechanical system, and electrical system installation requirements of ANSI A119.1 and 24 CFFR 280.

a. ~~a.~~ Trailer/~~mobile home complexes~~modular structures that exceed 2500 square feet shall meet all requirements for permanent structures listed in this document and local codes.
   1) ~~1.~~ Trailer/~~mobile home~~ modular structures shall be fully sprinklered.
   2) ~~2.~~ Trailer/~~mobile home~~modular structures shall have full smoke detection evacuation fire alarm system.
b. ~~b.~~ Requirements for smaller complexes shall be determined by the LaRC AHJ.

8.4.3.1.2 ~~8.4.3.1.2~~ All portable structures shall meet the minimum requirements as specified as specified in the International Building Code (IBC).

a. ~~a.~~ All portable structures used to support construction/demolition operations shall be in accordance with NFPA 241 and 29 CFR 1926.
b. ~~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.

8.4.3.1.3 ~~8.4.3.1.4~~ Trailers and ~~mobile home units~~modular structures arranged for occupancy shall comply with the interior finish, concealed space and exit requirements of NFPA 101.

8.4.3.1.3.1 ~~a.~~ Trailers and ~~mobile home units~~modular structures shall be located in accordance with NFPA 80A but in no case less than 25 feet from permanent facilities and no less than 25 feet apart.

8.4.3.2 ~~8.4.3.2~~ Anchors and Supports

8.4.3.2.1 ~~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. ~~a.~~ Support and anchoring equipment shall be in accordance with the manufacturer's specifications.
b. ~~b.~~ Supports and anchoring shall be required to support against wind loads as per the IBC.

8.4.3.2.2 ~~8.4.3.2.1~~ Deviations from approved stabilization plans shall be designed by a registered structural engineer.

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

8.4.3.3 ~~8.4.3.3~~ Skirting

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

8.4.3.3.1.1 ~~a.~~ Semi-trailers (such as compressed gas tube trailers) used exclusively for storage shall also require skirting.

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

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

8.4.3.4 ~~8.4.3.4~~ Pedestrian and Handicapped Access

8.4.3.4.1 ~~8.4.3.4.1~~ All walkways shall be constructed of weather resistant materials for ~~those~~ walkways used for temporary construction trailers.
8.4.3.4.1.1 ~~a.~~ Walkways shall be constructed of weather resistant lumber with a permanent nonskid surface.

8.4.3.4.2 ~~8.4.3.4.2~~ A means of egress from a portable structure that discharges ~~into~~adjacent to a roadway or ~~traffic flow area~~~~or~~ sidewalk shall be required. The means of egress shall be crush and run, concrete, or other material approved by the LaRC AHJ. Egress across grass is not acceptable.

8.4.3.4.3 ~~8.4.3.4.3~~ Stairs with platforms and handrails shall be provided for each exterior door as per NFPA 101. Exterior stairs, ramps, platforms, and walkways shall have a permanent nonskid walking surface.

8.4.3.4.4 ~~8.4.3.4.4~~ Ramps or wheelchair lifts shall be provided for portable structures that are to be used by the physically handicapped unless otherwise authorized by the SPE for Architecture.

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

~~8.4.3.4.5 Stairs, ramps, and platforms shall be constructed of steel, concrete, fiberglass, or other weather resistant materials.~~
~~8.4.3.4.5.2~~8.4.3.4.5.1 ~~a.~~ All stairs shall comply with 29 CFR 1910 and NFPA 101.

8.4.3.5 ~~8.4.3.5~~ Electrical

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

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

8.4.3.5.2 ~~8.4.3.5.2~~ Main service disconnects shall be located on the outside of the portable structure and clearly identified.

8.4.3.5.3 ~~8.4.3.5.3~~ All electrical wiring practices, equipment, and installation shall be performed per NFPA 70, ~~Standard Practice Engineering~~SPE Electrical Manual, and approval by the LARC SPE for Electrical.

8.4.3.6 ~~8.4.3.6~~ Heating and Cooling Systems

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

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

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

8.4.3.6.3 ~~8.4.3.6.3~~ Only fixed HVAC systems shall be permitted.

8.4.3.6.4 ~~8.4.3.6.4~~ All HVAC systems, equipment, and installation shall comply with NFPA 90A, International Mechanical Code (IMC), the ~~Standard Practice~~SPE Engineering Mechanical Manual, and approval by the LaRC SPE for Mechanical.

8.4.3.7 ~~8.4.3.7~~ Exits

8.4.3.7.1 ~~8.4.3.7.1~~ All normally occupied portable structures shall have a minimum of two exits remote from each other. Other egress arrangements shall be permitted as specified by NFPA 101~~,~~. Life Safety Code. ***Exception****: Small construction trailers as approved by the LaRC AHJ.*

8.4.3.7.2 ~~8.4.3.7.2~~ The minimum width of any aisle serving to gain access to a corridor or exit passageway shall be ~~36~~30 inches in the clear.

8.4.3.7.3 ~~8.4.3.7.3~~ 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.

8.4.3.7.4 ~~8.4.3.7.4~~ No door opening in the means of egress shall be less than 32 inches in clear width.

8.4.3.7.5 ~~8.4.3.7.5 Doors~~Door shall be arranged to be readily opened from the egress side whenever the structure is occupied.

8.4.3.7.6 ~~8.4.3.7.6~~ Exits shall be marked by an approved internally-illuminated sign readily visible from any direction of exit access.

8.4.3.8 ~~8.4.3.8~~ Emergency lighting

8.4.3.8.1 ~~8.4.3.8.1~~ All portable structures shall have sufficient emergency lights to illuminate exit paths. ***Exception****: Small temporary construction trailers as approved by LaRC AHJ*.

8.4.3.9 ~~8.4.3.9~~ Location of Portable Structures Inside Other Structures

8.4.3.9.1 ~~8.4.3.9.1~~ Fire and life safety requirements shall be determined by LaRC AHJ on a case-by-case basis.

8.4.3.9.2 ~~8.4.3.9.2~~ 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 ~~8.4.3.10~~ Operation

8.4.3.10.1 ~~8.4.3.10.1~~ Flammable and/or combustible liquids shall comply with Section 8.2 of this document.

8.4.3.10.2 ~~8.4.3.10.2~~ Cutting, welding, open flame, or grinding shall be in accordance with Section 7.3 of this document.

8.4.3.10.3 ~~8.4.3.10.3~~ 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.

~~8.4.3~~8.4.4 ~~8.4.4~~ RESPONSIBILITIES

8.4.4.1 ~~8.4.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Ensure that practices delineated in this Section are followed.
b. Contact the LaRC AHJ prior to constructing or placing new portable structures.

~~8.11~~8.5 ~~8.5~~ FIRE PROTECTION FOR STORAGE FACILITIES AND AREAS

8.5.1 ~~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 ~~8.5.2~~ SCOPE

a. ~~8.5.2.1~~ This Section shall apply to all general storage facilities at LaRC.

b. ~~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 ~~8.5.3~~ REQUIREMENTS

8.5.3.1 ~~8.5.3.1~~ Construction

8.5.3.1.1 ~~8.5.3.1.1~~ Storage facilities shall be constructed in accordance with the applicable sections of the IBC and NFPA 101.

8.5.3.1.2 ~~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. ~~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. ~~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~~in NFPA 13.

8.5.3.2 ~~8.5.3.2~~ Operation (All Storage areas and facilities)

8.5.3.2.1 ~~8.5.3.2.1~~ Appropriate fire extinguishers shall be provided for storage facilities.

8.5.3.2.2 ~~8.5.3.2.2~~ Good housekeeping, orderliness, and maintenance of equipment shall be provided for storage facilities.

8.5.3.2.3 ~~8.5.3.2.3~~ Storage facilities shall be posted as “No Smoking” areas.

8.5.3.2.4 ~~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 ~~8.5.3.2.5~~ Waste created by packing materials which are used in the storage facility operations shall be removed from the storage facilities immediately after use or stored in approved metal containers with lids.

~~8.5.3.2.6.6~~8.5.3.2.6.1 ~~a. All combustible waste shall be removed from the storage facility after each work shift.~~

~~8.5.3.2.8~~8.5.3.2.6 ~~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.

8.5.3.2.6.1 ~~8.5.3.2.7~~ All combustible waste shall be removed from the storage facility after each work shift.

~~8.5.3.2.9~~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 ~~8.5.3.3~~ Yard/Outdoor Storage

8.5.3.3.1 ~~8.5.3.3.1~~ Yard/Outdoor storage shall only be permitted in designated locations.

8.5.3.3.1.1 ~~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~~.~~, as well as exposure hazard

8.5.3.3.2 ~~8.5.3.3.2~~ Clear aisles shall be maintained between the following per NFPA 1 and the International Fire Code (IFC).

a. Individual piles.
b. Piles and buildings~~.~~
c. Piles and boundary of yard/outdoor storage site.

8.5.3.3.3 ~~8.5.3.3.3~~ All aisles widths shall be twice the pile height.

8.5.3.3.4 ~~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 ~~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.

8.5.3.3.6 ~~8.5.3.3.6~~ Portable heating devices shall not be used or located within yard/outdoor storage areas.

8.5.3.3.7 ~~8.5.3.3.7~~ Smoking shall not be permitted in yard/outdoor storage areas.

8.5.3.3.8 ~~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 ~~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 ~~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 ~~8.5.3.3.11~~ Access to fire hydrants shall not be obstructed.

8.5.3.3.12 ~~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 ~~8.5.4~~ RESPONSIBILITIES

8.5.4.1 ~~8.5.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 ~~8.5.4.2~~ LaRC AHJ shall evaluate locations as requested to be used as a storage facility.

~~**8.6 FIRE PROTECTION FOR COMBUSTIBLE SOLIDS, METALS, AND DUSTS**~~

~~**8.6.1 PURPOSE**~~

8.6 ~~8.6.1.1~~ FIRE PROTECTION FOR COMBUSTIBLE SOLIDS, METALS, AND DUSTS

8.6.1 PURPOSE

This Section establishes the requirements for the use, storage, and handling of combustible solids, metals, and dusts at LaRC.

~~8.6.1~~8.6.2 ~~8.6.2~~ SCOPE

~~8.6.2.1~~ This Section shall apply to the design, operations requirements, and personnel responsibilities in locations where combustible solids, metals, and dusts are stored, processed, or handled.

~~8.6.2~~8.6.3 ~~8.6.3~~ REQUIREMENTS

8.6.3.1 ~~8.6.3.1~~ Design

8.6.3.1.1 ~~8.6.3.1.1~~ Facilities handling or storing combustible solids, metals, and dusts shall be in accordance with the IBC, IFC, and applicable NFPA standards.

8.6.3.1.2 ~~8.6.3.1.2~~ When purchasing or designing glove boxes ~~utilizing~~for inert environments to control ~~the~~a hazard, a reserve supply of inert gas shall be provided and available for emergency use.

8.6.3.1.2.1 ~~a.~~ LaRC AHJ and safety industrial hygienist (IH) shall approve all glove boxes before purchase or use.

8.6.3.2 ~~8.6.3.2~~ Operation

8.6.3.2.1 ~~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 ~~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). Operations shall be approved by Safety IH.

8.6.3.2.3 ~~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 ~~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.

8.6.3.2.5 ~~8.6.3.2.5 Nonsparking~~Non-sparking tools shall be used when handling combustible metals dusts.

8.6.3.3 ~~8.6.3.3~~ Pyrophoric Materials

8.6.3.3.1 ~~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 ~~8.6.3.3.2~~ Class D portable fire extinguishers shall be provided and located so that the travel distance to an extinguisher shall be in accordance with NFPA 10.

8.6.3.3.3 ~~8.6.3.3.3~~ Other combustible materials shall not be stored in the designated pyrophoric materials storage area~~.~~:

a. ~~a.~~ This designated storage area shall be separated from storage of Class A combustible materials by at least 30 feet.
b. ~~b.~~ Fire walls with a 2-hour rating shall be provided.
c. ~~c.~~ Any opening in this wall shall be protected by listed, 1~~½~~ 1/2 hour, automatically closing fire doors.
~~d.~~ The designated storage area shall be separated from combustible liquids storage by at least 50 feet~~.~~
~~e.~~d. ~~e.~~ or fire walls with a 4-hour rating shall be provided~~.~~

~~f.~~e. ~~f.~~ Any opening in this wall shall be protected by listed, 3-hour, automatically closing fire doors on both sides of the opening.

~~g.~~f. ~~g.~~ Appropriate secondary confinement shall be provided to prevent any spilled liquids from entering the designated storage area.

~~h.~~g. ~~h.~~ Noncombustible materials in noncombustible containers on metal pallets shall be permitted to be stored in the separation space.

8.6.3.3.4 ~~8.6.3.3.4~~ Smoking and uncontrolled use of open flames shall be prohibited in the pyrophoric materials storage area.

~~8.6.3~~8.6.4 ~~8.6.4~~ RESPONSIBILITIES

8.6.4.1 ~~8.6.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 as 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 ~~8.7.1.1~~ FIRE PROTECTION FOR CLEAN ROOMS

8.7.1 PURPOSE

This Section establishes the requirements for the construction and use of clean room facilities at LaRC.

~~8.7.1~~8.7.2 ~~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.

~~8.7.2~~8.7.3 ~~8.7.3~~ REQUIREMENTS

8.7.3.1 ~~8.7.3.1~~ Construction

8.7.3.1.1 ~~8.7.3.1.1~~ NASA clean rooms shall be constructed and protected in accordance with the appropriate provisions of NFPA 318 and FM Data Sheet 1-56 or as required by LaRC AHJ.

8.7.3.1.2 ~~8.7.3.1.2~~ An automatic fire suppression shall be provided throughout facilities containing clean rooms and clean zones.

a. ~~a.~~ Sprinklers shall be installed throughout all clean rooms regardless of classification.
b. ~~b.~~ Sprinkler temperature rating within the clean room shall be 155~~°F.~~ degrees Fahrenheit.
c. ~~c.~~ Special consideration may be given for the installation of local application, gaseous suppression systems to protect special hazards.
d. ~~d.~~ An FM-200 clean agent fire suppression system ~~can~~may be used with or in lieu of sprinkler system per ~~determination by LaRC~~the discretion of the AHJ.

8.7.3.1.3 ~~8.7.3.1.3~~ Clean rooms shall be separated from adjacent occupancies by 1-hour fire resistant construction or as otherwise required by LaRC AHJ.

a. ~~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. ~~b.~~ The cutoff construction shall have a fire resistance commensurate with both the clean room and exposing area hazards and values.
c. ~~c.~~ Clean room~~s~~ shall be located to minimize external exposure from fires and other hazards.
d. ~~d.~~ Floors over clean rooms shall be made watertight.
e. ~~e.~~ Fire retardant plastic ~~panels~~ prone to producing large quantities of smoke shall not be used in the construction of clean rooms.
f. ~~f.~~ Noncombustible panels shall be used instead.
g. ~~g.~~ Benches and hoods shall be of noncombustible construction or protected with automatic sprinklers.

8.7.3.1.4 ~~8.7.3.1.4~~ Portable tent enclosures utilized as clean rooms shall comply with the following:

a. ~~a.~~ Automatic fire suppression system shall be required on interior if portable tent enclosure impedes facility automatic fire suppression system.
b. ~~b.~~ Smoke detectors shall be added to enclosure and tied into facility fire alarm system.
c. ~~c.~~ Tent shall be constructed of materials compliant flammability requirements of NFPA 101.
d. ~~d.~~ Enclosures shall not be located within the facility such that it impedes the facility egress system. Location must be approved by the AHJ.
e. ~~e.~~ Enclosures shall be approved by LaRC AHJ and Safety IH prior to purchase and installation.

8.7.3.1.5 ~~8.7.3.1.5~~ High-efficiency particulate air (HEPA) filtration systems shall be protected in accordance with Section 8.15 of this document. Clean room ventilating ducts and equipment shall be constructed of noncombustible materials.

8.7.3.1.6 ~~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 detection~~s~~ systems such as Very Early Smoke Detection Apparatus (VESDA~~.~~).

~~8.7.3.3~~8.7.3.2 ~~8.7.3.2~~ Operation

8.7.3.2.1 ~~8.7.3.2.1~~ Fire extinguishers shall be provided for clean room facilities in accordance with NFPA 10. Due to inherent difficulties entering and leaving clean rooms, each clean room shall have their own 15-lb. 2A:10B:C Halotron portable fire extinguisher installed with 3-D signage above extinguisher location.

8.7.3.2.2 ~~8.7.3.2.2~~ Good housekeeping, orderliness, and maintenance of equipment shall be provided for clean room facilities.

~~8.7.3.2.3~~ Combustible materials which are used in ~~the~~ clean room facility operations shall be removed from the clean room ~~facilities~~ immediately after use, or ~~8.7.3.2.4~~8.7.3.2.3 ~~a. Combustible materials which are used in the clean room facility operations shall be~~ stored in approved metal containers with lids.

~~8.8.3.5.5~~8.8.3.5.1 ~~8.7.3.2.4~~ ~~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.~~

8.7.3.2.4 ~~8.7.4~~ The required minimum clear width of exits, aisles, and passageways to an exit shall be maintained at all times as specified in NFPA 101.

~~8.7.3~~8.7.4 RESPONSIBILITIES

8.7.4.1 ~~8.7.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that ~~practices~~requirements delineated in this Section are followed.

8.7.4.2 ~~8.7.4.2~~ The LaRC AHJ shall evaluate clean rooms in accordance with this Section as requested.

8.7.4.3 ~~8.7.4.3~~ COD shall ensure that all new clean room facilities or modifications to existing facilities meet the requirements of this Section. All plans and specifications for clean rooms shall be submitted to AHJ for review and approval prior to the letting of contracts or start of work.

8.8 FIRE PROTECTION FOR AIRCRAFT HANGARS

8.8.1 PURPOSE

This Section establishes the requirements for the construction and use of aircraft hangar facilities at LaRC.

~~8.8.1~~8.8.2 ~~8.8.2~~ SCOPE

~~8.8.2.1~~ This Section shall apply to all aircraft hangar facilities at LaRC.

~~8.8.2~~8.8.3 ~~8.8.3~~ REQUIREMENTS

8.8.3.1 ~~8.8.3.1~~ General

~~8.8.3.1.1~~ NASA aircraft hangars shall be constructed and protected in accordance with the provisions of NFPA 409 and FM Data Sheets 7-93 and 7-93N ~~or~~.

8.8.3.2 ~~8.8.3.2~~ Protection Systems

8.8.3.2.1 ~~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~~as specified in accordance with NFPA 409.
b. Overhead foam-water wet pipe sprinkler systems and AFFF monitor nozzles.
c. Design~~ed~~ utilizing performance-based solution, with appropriate fire modeling justifying solution as required by NFPA. Acceptance of any performance-based solution rest solely with the AHJ.

8.8.3.3 ~~8.8.3.3~~ Construction

8.8.3.3.1 ~~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 ~~8.8.3.3.2~~ New aircraft ramps used for fueling operations shall be designed in accordance with NFPA 415.

8.8.3.4 ~~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 ~~8.8.3.5~~ Operation

8.8.3.5.1 ~~8.8.3.5.1~~ Appropriate fire extinguishers shall be provided for aircraft hangar facilities.

8.8.3.5.2 ~~8.8.3.5.2~~ Good housekeeping, orderliness, and maintenance of equipment shall be provided for aircraft hangar facilities.

8.8.3.5.3 ~~8.8.3.5.3~~ Aircraft hangar facilities shall be posted as “No Smoking” areas.

8.8.3.5.4 ~~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.

8.8.3.5.4.1 ~~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 liquid storage ~~lockers~~cabinets.

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.

~~8.9.3.2.5~~8.9.3.2.1 ~~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.~~

~~8.8.3.5.7~~8.8.3.5.6 ~~8.8.3.5.6~~ Aircraft fuel servicing operations shall be in accordance with NFPA 407.

~~8.8.3.5.8~~8.8.3.5.7 ~~8.8.3.5.7~~ Aircraft maintenance operations shall be in accordance with NFPA 410.

~~8.8.3.5.9~~8.8.3.5.8 ~~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.

~~8.8.3.5.10~~8.8.3.5.9 ~~8.8.3.5.9~~ Waste storage shall not be located within the hangar and shall be disposed of in an approved location outside. This requirement supersedes all environmental regulations calling for waste to be stored indoors in proximity to where it is generated.

~~8.8.3.5.11~~8.8.3.5.10 ~~8.8.3.5.10~~ All electrical systems / equipment (including computers, battery chargers, extension cords, cell phones) within 18 inches of the floor and within the classified bubble around the aircraft shall either be UL-Listed as explosion proof or intrinsically safe.

~~8.8.3~~8.8.4 ~~8.8.4~~ RESPONSIBILITIES

8.8.4.1 ~~8.8.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that practices delineated in this Section are followed.

8.8.4.2 ~~8.8.4.2~~ LaRC AHJ shall evaluate aircraft hangars in accordance with this Section as requested.

8.8.4.3 ~~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

This Section establishes the requirements for the construction and use of flight simulator facilities at LaRC.

~~8.9.1~~8.9.2 ~~8.9.2~~ SCOPE

~~8.9.2.1~~ This Section shall apply to all new flight simulator facilities; and to existing flight simulator facilities undergoing significant ~~renovation.~~
~~a. Existing flight simulators undergoing significant renovation shall comply~~renovations and compliance with ~~these~~ requirements to the extent practicable.

~~8.9.2~~8.9.3 ~~8.9.3~~ REQUIREMENTS

8.9.3.1 ~~8.9.3.1~~ Construction and Protection

8.9.3.1.1 ~~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 ~~8.9.3.1.2.~~ Facilities and rooms containing flight simulators as well as ~~the~~ training module~~s~~ shall be constructed of noncombustible materials.

8.9.3.1.3 ~~8.9.3.1.3 The~~ Hydraulic fluid pump~~s~~ and reservoir~~s~~ shall be separated from other portions of the simulator facility by a minimum 1-hour fire resistant construction.

8.9.3.1.4 ~~8.9.3.1.4 The training module~~Training modules 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 ~~8.9.3.1.5~~ Actuation of the extinguishing system shall be ~~done~~accomplished by ionization-type smoke detectors or aspirating-type smoke detection system.

8.9.3.1.6 ~~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 ~~8.9.3.1.7 The~~ Hydraulic pump and storage facilit~~y~~ies shall be protected by automatic sprinklers over the hydraulic fluid pump room and storage facility in accordance with FM Data Sheet 7-3 and NFPA 13.

8.9.3.1.8 ~~8.9.3.1.8 The~~ Simulator system room and facility shall be protected with automatic sprinklers throughout all areas where there is combustible material ~~or~~ /construction or where hydraulic fluids are ~~used~~present.

8.9.3.1.9 ~~8.9.3.1.9~~ HEPA filtration systems shall be protected in accordance with Section 8.15 of this document.

8.9.3.1.10 ~~8.9.3.1.10~~ A complete fire detection and evacuation alarm system shall be provided in facilities containing flight simulators.

8.9.3.1.10.1 ~~a.~~ When various levels of detection are used, the signaling system shall be arranged to sound at a constantly attended location (control room).

8.9.3.1.11 ~~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.

8.9.3.2 ~~8.9.3.2~~ Operation

8.9.3.2.1 ~~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 ~~8.9.3.2.2~~ Good housekeeping, orderliness, and maintenance of equipment shall be provided for flight simulator facilities.

8.9.3.2.3 ~~8.9.3.2.3~~ Combustible materials which are used in the flight simulator facility operations shall be removed from the flight simulator facilities immediately after use.

8.9.3.2.4 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.

~~8.10.3.2.4~~8.10.3.2.1~~8.9.3.2.4 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.~~

8.9.3.2.5 ~~8.9.4~~ Where a special protocol has been developed and implemented for the emergency evacuation of simulator while on cockpit motion bay, strict adherence to protocol is mandatory.

~~8.9.3~~8.9.4 RESPONSIBILITIES

8.9.4.1 ~~8.9.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that practices delineated in this Section are followed.

8.9.4.2 ~~8.9.4.2~~ The LaRC AHJ shall evaluate flight simulators in accordance with this Section when requested.

8.9.4.3 ~~8.9.4.3~~ COD shall ensure that all new flight simulator facilities or modifications to existing facilities meet the requirements of this Section and include AHJ in all matters relating to said activities.

~~**8.10 FIRE PROTECTION FOR COMPUTER FACILITIES**~~

~~**8.10.1 PURPOSE**~~

8.10 ~~8.10.1.1~~ FIRE PROTECTION FOR COMPUTER FACILITIES

8.10.1 PURPOSE

This Section establishes the requirements for the installation and use of computer facilities at LaRC.

~~8.10.1~~8.10.2 ~~8.10.2~~ SCOPE

8.10.2.1 ~~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. Installation~~s~~ deemed "essential electronic equipment" by LaRC AHJ.
c. Valued at $~~1 million~~1M or more.

~~8.10.2.3~~8.10.2.2 ~~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, early detection systems such as VESDA, or use of fire and smoke barriers.

~~8.10.2~~8.10.3 ~~8.10.3~~ REQUIREMENTS

8.10.3.1 ~~8.10.3.1~~ Construction

8.10.3.1.1 ~~8.10.3.1.1~~ All new computer facilities shall meet the minimum constructions requirements.

8.10.3.1.2 ~~8.10.3.1.2~~ All new computer facilities shall comply with NFPA 75 and NASA STD 8719.11, Section 703, except as modified herein.

8.10.3.1.3 ~~8.10.3.1.3~~ Fire Department access shall comply with NFPA, IFC, Section 4.4, and any LaRC AHJ requirements.

8.10.3.2 ~~8.10.3.2~~ Operation

8.10.3.2.1 ~~8.10.3.2.1~~ Employees who normally work in computer facilities shall be familiar with the fire protection systems in their work area.

8.10.3.2.2 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.

~~8.10.3.2.2 The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times specified in NFPA 101.~~

~~8.10.3.2.4~~8.10.3.2.3 ~~8.10.3.2.3~~ All security entry locks and access control equipment shall fully comply with NFPA 101 requirements and receive approval ~~form~~from the LaRC AHJ prior to installation.
~~8.10.3.2.5~~8.10.3.2.4 ~~8.10.3.2.4~~ Penetrations through fire walls and areas underneath raised floors shall be maintained in accordance with NFPA 75. (Fire walls shall not be penetrated without prior approval by LaRC AHJ and cable located under raised floor shall be plenum-rated~~)~~ or enclosed in conduit).

~~8.10.3~~8.10.4 ~~8.10.4~~ RESPONSIBILITIES

8.10.4.1 ~~8.10.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 ~~8.10.4.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure ~~the area~~that areas under ~~the~~ raised ~~floor shall be~~floors are inspected annually to ~~a~~en~~s~~sure that no combustibles have accumulated or non-approved cables have been installed.

8.10.4.3 ~~8.10.4.2~~ The LaRC AHJ shall evaluate locations ~~as requested~~ to be used as computer facilities and modifications to existing computer facilities as requested.

~~**8.11 FIRE PROTECTION FOR ANECHOIC CHAMBERS**~~

~~**8.11.1 PURPOSE**~~

~~8.11.1.1~~

8.11 FIRE PROTECTION FOR ANECHOIC CHAMBERS

8.11.1 PURPOSE

This Section establishes the requirements for the construction and use of anechoic chamber facilities at LaRC.

~~8.11.1~~8.11.2 ~~8.11.2~~ SCOPE

8.11.2.1 ~~8.11.2.1~~ This Section shall apply to all new anechoic chamber facilities, and those undergoing significant renovation at LaRC.

8.11.2.2 ~~a.~~ Existing anechoic chamber facilities not undergoing renovation shall comply with the requirements listed below to the extent practicable.

~~8.11.2~~8.11.3 ~~8.11.3~~ REQUIREMENTS

8.11.3.1 ~~8.11.3.1~~ General

8.11.3.1.1 ~~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, ~~specific~~customized protection solutions must be employed to meet the criteria of NASA STD 8719.11.

8.11.3.1.2 ~~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~~10-53S.1, and 1-53S.2, except as amended herein.

8.11.3.1.3 ~~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.~~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 ~~8.11.3.2~~ Construction

8.11.3.2.1 ~~8.11.3.2.1~~ Control rooms shall be separated from the chamber by partitions having a fire resistance rating of 1 hour or higher as required by the LaRC AHJ.

8.11.3.2.2 ~~8.11.3.2.2~~ Vision panels shall ~~be no more than 1296~~not exceed 1,296 square inches ~~and shall be wired glass~~ in ~~steel frames~~area.

8.11.3.2.3 ~~8.11.3.2.3~~ Air conditioning systems or other chamber ducting shall be independent of main facility HVAC systems.

8.11.3.2.4 ~~8.11.3.2.4~~ All new anechoic chamber foam materials shall meet the fire retardant criteria specified by FM 1-53.

8.11.3.2.5 ~~8.11.3.2.5~~ Non-compliant foam in existing chambers with shall be eliminated wherever possible.

8.11.3.2.6 ~~8.11.3.2.6~~ Areas such as control rooms, concealed ceiling spaces, subfloor areas, and below pedestals shall be protected with automatic fire suppression if combustibles are present. ~~Said suppression shall be consistent with fire suppression of the chamber.~~

8.11.3.2.7 ~~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.
d. A main disconnect shall be located outside of chamber and accessible to emergency responders. Disconnect to be plainly labeled.
e. Portable lighting shall be listed for use and have mechanical guards over bulbs.
f. Where electrically classified areas exist, electrical equipment in those areas shall be listed for classification.

8.11.3.2.8 ~~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~~leakage.

8.11.3.2.9 ~~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 discharged during a fire event.

8.11.3.2.10 ~~8.11.3.2.10~~ Anechoic chambers shall be protected by a complete automatic sprinkler system.

***Exception**: Other types of automatic fire suppression suitable for the hazard may be permitted as deemed appropriate by LaRC AHJ.*

8.11.3.2.11 ~~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~~protrudes into the pipe interior, the resulting friction loss sh~~ou~~al~~d~~l be ~~established~~determined and taken into account in the hydraulic calculations.

8.11.3.2.12 ~~8.11.3.2.13~~ The sprinkler system water supply serving the anechoic chamber shall be designed in accordance with Table 8.1 and ~~is~~be controlled by a separate indicating-type control valve with tamper switch.

8.11.3.2.13 ~~8.11.3.2.14~~ HEPA filtration systems shall be in accordance with Section 8.15 of this document.

8.11.3.2.14 ~~8.11.3.2.15~~ A complete smoke detection system shall be provided in facilities containing anechoic chambers.

~~8.11.3.2.16~~ **Table 8.1**~~, Sprinklers for Anechoic Chambers~~ **– Sprinkler System Water Supply**

	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-ft² coverage, 10-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.30-gpm/ft² (12-l/min/m²) average density (Note 2)	X		X		
Automatic Sprinklers: 50-ft² coverage, 8-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.60-gpm/ft² (25-l/min/m²) average density (Note 2)		X		X (Note 3)	
Automatic Sprinklers: 40-ft² coverage, 7-ft max. spacing, 212ºF, standard sprinkler heads, 1/2-in. extra hazard piping, 0.60-gpm/ft² (25-l/min/m²) 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 ft² (186 m²) of floor area, the average density is for all heads. For chambers over 2000 ft², 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 ~~8.11.3.3~~ General Safeguards

8.11.3.3.1 ~~8.11.3.3.1~~ All equipment with fans shall have shields and screens installed to ensure free flow of inlet and outlet air.

8.11.3.3.1.1 ~~a.~~ No exposed electrical terminals of any kind shall be permitted on any equipment.

8.11.3.3.2 ~~8.11.3.3.2~~ Wiring in the chamber shall be repaired only by qualified personnel.

8.11.3.3.3 ~~8.11.3.3.3~~ Fire extinguishers ~~type and capacity~~ shall be provided near the chamber door. Type and capacity will be determined by the AHJ.
8.11.3.3.4 ~~8.11.3.3.4~~ If the control room ~~is~~in unoccupied, the following criteria shall be met if there is no suppression/detection system in the chamber.

a. ~~a.~~No equipment shall be left operating or energized in the chamber while the control room is unattended.
b. ~~b.~~At the close of business each day, all exterior doors to the chamber shall be closed.
c. ~~c.~~At the close of business each day, main power to the chamber shall be turned off and secured.

8.11.3.3.5 ~~8.11.3.3.5~~ Flammable or combustible liquids shall not be permitted inside the chamber unless approved by the LaRC Fire Chief.

8.11.3.3.6 ~~8.11.3.3.6~~ Welding operations shall comply with Section 7.3 of this document.

8.11.3.3.7 ~~8.11.3.3.7~~ High-intensity flood lamps shall be used only with the approval of the LaRC Fire Chief.

8.11.3.3.8 ~~8.11.3.3.8~~ Fire protection equipment shall be inspected and maintained as required in Section 5.6 of this document.
~~a. Particular attention shall be given to~~
8.11.3.3.8.1 Comply with the following:

a. The protection equipment shall be arranged so that it can be adequately tested every 6 months by simulating emergency mode conditions.
b. Where protection systems ~~use~~utilize telescoping "bayonet"-style sprinkler assemblies, they shall be moved through their full travel distance annually.

8.11.3.3.9 ~~8.11.3.3.9~~ All employees having access to the chamber shall receive basic instruction in the general operation of the fire protection system, including the ~~adverse~~function and consequences of using manual pulls or abort switches.

8.11.3.3.10 ~~8.11.3.3.10~~ The required minimum clear width of exits, aisles, and passageways to a public way shall be maintained at all times as specified in NFPA 101.

~~8.11.3~~8.11.4 ~~8.11.4~~ RESPONSIBILITIES

8.11.4.1 ~~8.11.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that practices delineated in this Section are followed.

8.11.4.2 ~~8.11.4.2~~ LaRC AHJ shall evaluate anechoic chambers in accordance with this Section as requested.

8.11.4.3 ~~8.11.4.3~~ COD shall ensure that all new anechoic chamber facilities or modifications to existing facilities meet the requirements of this Section~~.~~ and that all plans and specifications be reviewed and approved by the AHJ

~~**8.12 FIRE PROTECTION FOR TEMPORARY ENCLOSURES AND MEMBRANE STRUCTURES**~~

~~**8.12.1 PURPOSE**~~

8.12 ~~8.12.1.1~~ FIRE PROTECTIN FOR TEMPORARY ENCLOSURES AND MEMBRANE STRUCTURES

8.12.1 PURPOSE

This Section establishes the requirements for the installation and use of temporary enclosures and membrane structures at LaRC.

~~8.12.1~~8.12.2 ~~8.12.2~~ SCOPE

a. ~~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.
b. ~~a.~~ The scope of this Section ~~also~~ shall also require compliance with the applicable sections of ~~National Fire Protection Association (~~NFPA~~)~~ 241.

~~**8.12.3 REQUIREMENTS**~~

8.12.3 ~~8.12.3.1~~ REQUIREMENTS

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

8.12.3.2 ~~8.12.3.2~~ Temporary enclosures shall be provided with adequate temporary fire protection systems and/or portable fire extinguishers, as determined and approved by the LaRC Fire Chief.

a. ~~a.~~ Fire protection systems installed in temporary enclosures shall comply with ~~the~~all applicable NFPA standards.
b. ~~b.~~ Temporary enclosures shall require LaRC Fire Department inspections in accordance with Section 10.7 of this document.

8.12.3.3 ~~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. ~~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. ~~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 any accredited testing agency.
~~d.~~c. ~~(1)~~ Alternate markings ~~shall be~~are acceptable, if approved by the LaRC AHJ.
~~e.~~d. ~~d.~~ The purchase of lumber not meeting the requirements specified above shall be preapproved by the LaRC AHJ.
~~f.~~e. ~~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.
~~g.~~f. ~~f.~~ Exemptions shall be granted by exception rather than by rule.

g. ~~8.12.3.4~~ Above requirements do not apply to the use of insignificant amounts of combustible decorative trim such as wood moldings.

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~~flammability requirements of NFPA 701.

8.12.3.5 ~~8.12.3.5~~ The material specified for the shell of a membrane structure shall pass the NFPA 701 large-scale test.

a. ~~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. ~~b.~~ The material specified for the shell of a membrane structure shall be submitted to a third-party, independent testing laboratory for evaluation.
c. ~~c.~~ The test results shall be submitted to the LaRC AHJ for review and ~~authority.~~ approval.
d. ~~d.~~ The material specified for the shell of a membrane structure shall be tested and evaluated, in accordance with 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 ~~8.12.3.6~~ The use of temporary equipment or structures may be approved for up to 6 months.

a. ~~a.~~ Users may apply for one 6-month extension.
b. ~~b.~~ Temporary equipment or structures shall not exceed 1 year.

c. ~~c.~~ Temporary equipment or structures in use or remaining at the Center for over one year shall be brought up to code as a permanent facility, or either removed from LaRC.

8.12.3.7 ~~8.12.3.7~~ All enclosing material shall be fastened securely so it cannot be blown against heaters or other sources of ignition.

8.12.3.7.1 ~~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 ~~8.12.3.8~~ All construction/operation electrical wiring and equipment for light, heat, or power supplies shall be in accordance with the applicable sections of NFPA 70.

8.12.3.9 ~~8.12.3.9~~ Flammable and/or combustible liquids shall be kept to an absolute minimum.

a. ~~a.~~ Flammable and/or combustible liquids shall be stored ~~in~~ and dispensed from UL listed or FM approved steel safety cans.
b. ~~b.~~ Flammable and/or combustible liquid-soaked clothes, rags, or waste shall be stored in UL listed or FM approved steel safety containers.

8.12.3.10 ~~8.12.3.10~~ Combustible waste materials which are used in the enclosure operations (e.g., rags, paper products) shall be removed from the enclosure immediately after use, or:

a. ~~a.~~ Combustible waste materials which are used in the enclosure operations shall be stored in approved metal containers with lids in place.
b. ~~b.~~ All combustible waste shall be removed from the enclosure after each work shift.

8.12.3.11 ~~8.12.3.11~~ 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.

8.12.3.12 ~~8.12.3.12~~ Cutting, welding, open flame, or grinding shall not be performed in enclosures without an approved Hot Work permit in accordance with Section 7.3 of this document.

8.12.3.13 ~~8.12.3.13~~ 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 ~~8.12.4~~ **RESPONSIBILITIES**

8.12.4.1 ~~8.12.4.1 Facility Coordinator and/or Facility Safety Head or~~FC and/or FSH and COD shall ensure that practices delineated in this section are followed and contact the LaRC AHJ prior to establishing new temporary enclosures.

8.12.4.2 ~~812.4.2~~ LaRC AHJ shall, when requested, evaluate locations requested to be used as a temporary enclosure.

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.~~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.~~

~~**8.13 FIRE PROTECTION FOR VITAL RECORDS STORAGE**~~

~~**8.13.1 PURPOSE**~~

8.12.4.3 ~~8.13.1.1~~

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.~~

8.13.1.2 ~~8.13.2~~ This Section does not address requirements that may be part of a security program needed to prohibit forcible entry.

~~8.13.1~~8.13.2 SCOPE

~~8.13.2.1~~ This Section shall apply to the collection of vital records in record storage facilities/areas at LaRC.

~~8.13.2~~8.13.3 ~~8.13.3~~ REQUIREMENTS

8.13.3.1 ~~8.13.3.1~~ Construction

8.13.3.1.1 ~~8.13.3.1.1~~ Record storage facilities/areas shall be constructed in accordance with the applicable sections of NFPA 232.

8.13.3.1.2 ~~a.~~ Record storage vaults and file rooms exceeding 50,000 cubic feet; and all archives and records centers; shall be in accordance with NFPA 232.

8.13.3.1.3 ~~8.13.3.1.2~~ Record storage facilities which store vital and important records shall be located in noncombustible facilities protected throughout with automatic sprinklers.

8.13.3.1.4 ~~a.~~ Areas that provide storage of vital and important records shall be equipped with approved smoke detection systems.

8.13.3.2 ~~8.13.3.2~~ Operation

8.13.3.2.1 ~~8.13.3.2.1~~ Vital and important records (as defined by NFPA 232) shall be protected against fire.

8.13.3.2.2 ~~8.13.3.2.2~~ Records that can be reproduced shall be duplicated and stored away from the originals (separate fire area or facility) so they will not be subject to the same fire incident.

8.13.3.2.3 ~~8.13.3.2.3~~ Per NFPA 10 fire extinguishers shall be provided for record storage facilities.

8.13.3.2.4 ~~8.13.3.2.4~~ Good housekeeping, orderliness, and maintenance of equipment shall be provided for record storage facilities.

8.13.3.2.5 ~~8.13.3.2.5~~ Record storage facilities shall be posted as “No Smoking” areas.

8.13.3.2.6 ~~8.13.3.2.6~~ Record storage facilities shall not be used as working spaces.

8.13.3.2.7 ~~8.13.3.2.7~~ 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.

8.13.3.2.7.1 ~~a.~~ All combustibles waste shall be removed from the record storage facility after each work shift.

8.13.3.2.8 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.

~~8.14.3.2.88.14.3.2.1~~ ~~8.13.3.2.8~~ ~~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~~8.13.3.2.9 ~~8.13.3.2.9~~ 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 ~~8.14.1.1~~ FIRE PROTECTION FOR OVENS, FURNACES, AND ENVIRONMENTAL CHAMBERS

8.14.1 PURPOSE

This Section establishes the fire protection requirements for the installation and use of ovens, furnaces, and environmental chambers at LaRC.

~~8.14.1~~8.14.2 ~~8.14.2~~ SCOPE

~~8.14.2.1~~ This Section shall apply to the design, operational requirements, and personnel responsibilities for ovens, furnaces, and environmental chambers ~~creating fire protection issues~~ at LaRC.

~~8.14.2~~8.14.3 ~~8.14.3~~ REQUIREMENTS

8.14.3.1 ~~8.14.3.1~~ Design

8.14.3.1.1 ~~8.14.3.1.1~~ Before new equipment is installed or existing equipment is modified or relocated, complete plans, sequence of operations, and specifications shall be submitted to the LaRC AHJ for approval.

a. ~~a.~~ Plans shall be drawn and show all essential details as to location, construction, ventilation, piping, and electrical safety equipment.
b. ~~b.~~ A list of all combustion control and safety equipment, including manufacturer and type/model number, shall be included.
c. ~~c.~~ Wiring diagrams and sequence of operations for all safety controls shall be provided.
d. ~~d.~~ All wiring in and around ovens, furnaces, and environmental chambers shall be in accordance with NFPA 70.

8.14.3.1.2 ~~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.

8.14.3.1.2.1 ~~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 ~~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 ~~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 ~~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 ~~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.

8.14.3.1.6.1 ~~a.~~ When oven, furnace, or environmental chamber temperature~~s~~ are over 465~~°F~~ degrees Fahrenheit 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 ~~8.14.3.2~~ Operation

8.14.3.2.1 ~~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~~.~~

8.14.3.2.2 ~~8.14.3.2.3~~ Portable fire extinguishers shall be provided for the appropriate hazards as per NFPA 10.

8.14.3.2.3 ~~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.

8.14.3.2.4 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.

~~8.13.3.2.4~~8.13.3.2.1When 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.~~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.~~

~~8.14.3.2.6~~8.14.3.2.5

~~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.~~

~~8.14.5~~8.14.4 ~~8.14.4~~ RESPONSIBILITIES

8.14.4.1 ~~8.14.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 ~~8.14.4.2~~ LaRC AHJ shall:

a. Evaluate and approve the purchase and 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 ~~8.14.4.3~~ COD shall ensure that the design requirements delineated in this Section are followed.

8.14.4.4 ~~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 ~~8.15.1.1~~ FIRE PROTECTION FOR HEPA FILTER SYSTEMS

8.15.1 PURPOSE

This Section ~~establishes the requirements for the installation and use of high-efficiency particulate air (HEPA)~~shall apply to new permanent HEPA filters and equipment at LaRC~~.~~, as well as change outs made to permanent systems.

~~8.15.1~~8.15.2 ~~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.

~~8.15.2~~8.15.3 ~~8.15.3~~ REQUIREMENTS

8.15.3.1 ~~8.15.3.1~~ Atmosphere Filtration

8.15.3.1.1 ~~8.15.3.1.1~~ Air and inert gas shall enter each ventilated area through at least one fire resistant HEPA filter.

8.15.3.1.2 ~~8.15.3.1.2~~ Air and inert gas shall be discharged through at least one fire resistant pre-filter and one fire resistant HEPA filter to exhaust ductwork leading to a final filter system.

8.15.3.2 ~~8.15.3.2~~ Ventilation System Fire Protection

8.15.3.2.1 ~~8.15.3.2.1~~ The ventilation system shall be designed to withstand any credible fire or explosion.

a. ~~a.~~ The ventilation system shall continue to act as a confinement barrier.
b. ~~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 ~~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. ~~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. ~~b.~~ If it can be determined that the filters can be subjected to sufficient heat to cause failure, the final filters ~~shall~~can be protected by heat removal or sprinkler systems that automatically activate at a preset temperature.
c. ~~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. ~~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. ~~e.~~ A roughing filter shall be mounted behind these components to remove the bulk of the draft-carried debris.

8.15.3.2.3 ~~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.

8.15.3.2.3.1 ~~a.~~ A manually operated valve actuating the spray system also shall be provided as a backup.

8.15.3.3 ~~8.15.3.3~~ Instrumentation

8.15.3.3.1 ~~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. ~~a.~~ These areas shall be designed to permit occupancy and the ability to operate ventilation systems safely during normal and abnormal conditions.
b. ~~b.~~ The instrumentation system shall provide the following:
   1) ~~(1)~~ Readout from appropriate surveillance instrumentation for all essential functions of the ventilation systems.
   2) ~~(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) ~~(3)~~ For normal or abnormal conditions, where combustible solvents, gases, and vapors could possibly be present in a ventilation system, continuous monitoring systems suitable for monitoring such substances shall be included in the design, with readout normally in the control room.
   4) ~~(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.

~~8.15.3~~8.15.4 ~~8.15.4~~ RESPONSIBILITIES

8.15.4.1 ~~8.15.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that ~~practices~~the requirements 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 ~~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~~

~~8.16.1 PURPOSE~~

8.16 ~~8.16.1.1~~ FIRE PROTECTION FOR HAZARDOUS MATERIALS

8.16.1 PURPOSE

This Section establishes the requirements for the storage, handling, and use of hazardous materials at LaRC. Hazardous materials ~~are~~such as defined by the IFC and NFPA and can include flammable and combustible liquids, gases, corrosives, oxidizers, water reactive chemicals, and radioactive materials.

~~8.16.1~~8.16.2 ~~8.16.2~~ SCOPE

~~8.16.2.1~~ This Section shall apply to the handling and storage of hazardous materials at LaRC.

~~8.16.2~~8.16.3 ~~8.16.3~~ REQUIREMENTS

8.16.3.1 General

~~8.16.3.1 Design~~

~~8.16.3.1.3~~8.16.3.1.1 ~~8.16.3.1.1~~ Hazardous material storage shall be separated by minimum distances from other facilities and personnel.

~~8.16.3.1.4~~8.16.3.1.2 ~~8.16.3.1.2~~ Hazardous material storage areas and buildings shall be provided with containment for liquid runoff control to include volume of single largest container plus fire suppression water.

~~8.16.3.1.5~~8.16.3.1.3 ~~8.16.3.1.3~~ Hazardous material storage buildings and ~~aboveground~~above ground tanks shall be designed in accordance with IFC, NFPA, and STD 8719.11 requirements and recommendations.

~~8.16.3.1.6~~8.16.3.1.4 ~~8.16.3.1.4~~ When required by code, separate hazardous material containment buildings shall be provided with fire sprinkler systems or other approved fire protection control and extinguishing systems.

~~8.16.3.1.7~~8.16.3.1.5 ~~8.16.3.1.5~~ HVAC systems serving hazardous material storage areas shall not serve other portions of a facility.

~~8.16.3.1.8~~8.16.3.1.6 ~~8.16.3.1.6~~ Facility and individual hazardous material storage areas shall have appropriate NFPA 704 placarding, as well as, signage required by OSHA 1910.11.

~~8.16.3.1.9~~8.16.3.1.7 ~~8.16.3.1.7~~ All electrical systems shall comply with NFPA 70 for hazardous material locations.

~~8.16.3.1.10~~8.16.3.1.8 ~~8.16.3.1.8~~ Aisle ways, entry ways, and access ways shall be maintained so as not to obstruct emergency egress.

~~8.16.3.1.11~~8.16.3.1.9 ~~8.16.3.1.9~~ Incompatible hazardous materials in the same facility shall be separated by suitable fire rated construction.

~~8.16.3.1.12~~8.16.3.1.10 ~~8.16.3.1.10~~ As per NFPA 10, suitable fire extinguishers in hazardous storage buildings shall be provided for the particular hazard.

~~8.16.3.1~~8.16.3.2 ~~8.16.3.2~~ Operation

8.16.3.2.1 ~~8.16.3.2.1~~ Hazardous materials shall be stored in appropriate containers.

8.16.3.2.2 ~~8.16.3.2.2~~ Accumulation of combustible materials such as cartons, papers, and packaging materials shall be prohibited in and around hazardous material storage.

8.16.3.2.3 ~~8.16.3.2.3~~ Weeds, rubbish, or similar combustibles shall not be permitted within 15 feet of hazardous material storage areas.

8.16.3.2.4 ~~8.16.3.2.4~~ Smoking shall not be permitted in or near hazardous materials storage areas.

8.16.3.2.5 ~~8.16.3.2.5~~ Hazardous materials storage facilities shall not be used as dispensing facilities.

8.16.3.2.6 ~~8.16.3.2.6~~ All spills shall be responded to and controlled per LPR 8715.12 – LaRC Integrated Spill Contingency Plan.

~~8.16.3~~8.16.4 ~~8.16.4~~ RESPONSIBILITIES

8.16.4.1 ~~8.16.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall contact the LaRC AHJ prior to establishing new hazardous materials storage facilities.

8.16.4.2 ~~8.16.4.2~~ LaRC AHJ shall evaluate locations as requested to be used as hazardous materials storage facilities.

8.16.4.3 ~~8.16.4.3~~ COD shall ensure that the design requirements delineated in this Section are followed.

~~8.17 FIRE PROTECTION FOR CHEMICAL LABORATORY FACILITIES~~

~~8.17.1 PURPOSE~~

8.17 8.17.1.1 FIRE PROTECTION FOR CHEMICAL LABORATORY FACILITIES

8.17.1 PURPOSE

This Section establishes th~~e~~is requirements for the installation and use of chemical laboratory facilities at LaRC.

~~8.17.1~~8.17.2 8.17.2 SCOPE

~~8.17.2.1~~ This Section shall apply to all chemical laboratories at LaRC.

~~8.17.2~~8.17.3 8.17.3 REQUIREMENTS

8.17.3.1 ~~8.17.3.1~~ Construction

8.17.3.1.1 ~~8.17.3.1.1~~ All laboratories shall meet the minimum constructions requirements specified in the IBC and NFPA 45.

8.17.3.1.2 ~~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 ~~8.17.3.1.3~~ Venting or releasing of inert, flammable, oxidizers, and toxic gases are strictly prohibited inside a facility.

8.17.3.1.4 ~~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 ~~8.17.3.1.5~~ Operating controls for research equipment shall be accessible under normal and emergency conditions.

8.17.3.1.6 ~~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 ~~8.17.3.1.7~~ Fire extinguishers training shall be required for all chemical ~~labs~~lab personnel at LaRC.

8.17.3.1.8 ~~8.17.3.1.8~~ Design, purchase, and installation of fume hood systems in chemical labs shall comply with NFPA 45 and NFPA 91.

8.17.3.1.9 ~~8.17.3.1.9~~ Any lab ~~designed~~ where inert, flammable, oxidizer~~s~~, and toxic gases are used, ~~a~~an approved fixed gas monitoring system~~s~~ tied to the facility fire alarm

system shall be installed. Exception: Instances where the NASA AHJ and Safety IH determine hazard is inconsequential and monitoring not warranted.

8.17.3.1.10 ~~8.17.3.1.10~~ Labs that use gas ~~storage~~ cabinets shall have ventilation systems that meet the following:

a. ~~a. Shall be~~ Vented to the outside.
b. ~~b. Shall not be~~Not manifolded with other systems.
c. ~~c. Shall have automatic~~Automatic gas shutoff valve for loss of ventilation~~.~~
d. ~~d. Shall have~~ Suppression system (sprinklers) is required ~~by applicable codes~~inside cabinet.
e. ~~e. Shall have automatic shutoff upon~~Permanent gas detection ~~of a leak.~~system
f. ~~f.~~ Automatic gas shutoff interlock upon detection of a leak
~~f.~~g. Upon detection of a leak condition, gas detection system shall ~~be reported~~report automatically to the facility fire alarm control panel.

8.17.3.2 ~~8.17.3.2~~ Operation

8.17.3.2.1 ~~8.17.3.2.1~~ The quantity of hazardous chemicals stored in the open in a laboratory shall comply with NFPA 45.

8.17.3.2.2 ~~8.17.3.2.2~~ Incompatible materials shall be segregated to prevent accidental contact with one another.

8.17.3.2.3 ~~8.17.3.2.3~~ Containers of materials that may become hazardous over time shall be dated.

8.17.3.2.4 ~~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 ~~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 ~~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.

~~8.17.3~~8.17.4 ~~8.17.4~~ RESPONSIBILITIES

8.17.4.1 ~~8.17.4.1 Facility Coordinator and/or Facility Safety Head shall ensure~~FC and/or FSH ensures 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 ~~8.17.4.2~~ LaRC AHJ ~~shall~~ evaluate locations as requested to be used as laboratories and modifications to existing laboratories.

8.17.4.3 ~~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 ~~8.18.1.1~~ FIRE PROTECTION FOR VACANT FACILITIES

8.18.1 PURPOSE

This Section establishes the requirements for protecting vacant facilities at LaRC from fire and other related perils.

~~8.18.1~~8.18.2 ~~8.18.2~~ SCOPE

~~8.18.2.1~~ This Section shall apply to all vacant and abandoned facilities at LaRC.

8.18.3 ~~8.18.3~~ REQUIREMENTS

8.18.3.1 ~~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.*

8.18.3.1.1 ~~8.18.3.2~~ Vacant facility shall be managed and protected in accordance with the appropriate provisions of FM Data Sheet 9-17 and LaRC COD standards.

8.18.3.1.2 ~~8.18.3.3~~ Upon vacating or abandoning a facility or property, the ~~Facility Safety Head~~FSH shall have removed combustible and hazardous materials to the extent specified by Environmental Office, Safety Office, and Fire Protection Group in order to achieve an acceptable level of safety.

8.18.3.1.3 ~~8.18.3.4~~ Vacant facilities and properties shall be maintained ~~to be~~ free of accumulations of combustible and hazardous materials.

8.18.3.1.4 ~~8.18.3.5~~ Vacant facilities shall be maintained ~~to be~~ securely locked or barricaded to prevent entry by unauthorized persons.

8.18.3.1.5 ~~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 in the judgment of the LaRC AHJ create a fire hazard* ~~as approved by the LaRC AHJ~~.

8.18.3.1.6 ~~8.18.3.7~~ If maintaining sufficient facility heat to avoid freezing is impractical, the automatic sprinkler system shall be ~~arranged~~ reconfigured for cold weather operation in accordance with FM Data Sheet 2-8N.

8.18.3.1.6.1 ~~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.

8.18.3.1.7 ~~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.~~

~~8.18.3.1.10~~8.18.3.1.8 ~~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 NFPA 101.

~~8.18.3.1.11~~8.18.3.1.9 ~~8.18.3.11~~ Alternate use of facility while vacated shall be prohibited unless written approval is obtained from the Standard Practice Engineering and Environmental Branch (SPEE~~B~~D), COD, and LaRC AHJ.

8.18.4 ~~8.18.4~~ **RESPONSIBILITIES**

8.18.4.1 ~~8.18.4.1 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH for facility or property vacated shall ensure that ~~practices~~requirements delineated in this Section are followed.

8.18.4.2 ~~8.18.4.2~~ LaRC AHJ shall evaluate, when requested, vacant facilities in accordance with this Section.

8.18.4.3 ~~8.18.4.3~~ COD shall ensure that vacant, closed and abandon facilities meet these requirements.

~~CHAPTER 9~~

129 ~~9.~~ ASSESSMENT AND ANALYSIS

9.1 FIRE PROTECTION ENGINEERING SURVEY PROGRAM

9.1.1 PURPOSE

This Section identifies the requirements for the Fire Protection Engineering (FPE) survey program.

~~9.1.1~~9.1.2 ~~9.1.2~~ SCOPE

~~9.1.2.1~~ The requirements of this Section shall apply to the performance of FPE surveys at LaRC.

~~9.1.2~~9.1.3 ~~9.1.3~~ REQUIREMENTS

9.1.3.1 ~~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. ~~a.~~FPE surveys shall be conducted for facilities (plus equi~~pm~~valent) valued at $~~50 million~~50M or more, or where a significant safety hazard or vital programs are involved.
b. ~~b.~~Facilities valued at less than $~~500,000~~500K shall not require FPE surveys unless significant programmatic impacts, hazardous materials, or some other type of specialized hazard is involved.

9.1.3.2 ~~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 access
k. Identifying previously approved deviations and waivers for facility
l. Violations, Risk Assessment Code (RAC), and mitigation strategies.

9.1.3.49.1.3.3 9.1.3.3 The FPE surveys shall consist of a standardized report covering the topics identified in above.

9.1.3.3.1 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.

9.1.3.3.2 b. If significant changes have occurred, then the total report shall be issued.

9.1.3.59.1.3.4 9.1.3.4 The engineer performing the survey shall conduct an opening meeting with the Facility CoordinatorFC and/or Facility Safety HeadFSH to discuss the purpose of the review.

9.1.3.69.1.3.5 9.1.3.5 The finalized report shall be forwarded to the LaRC AHJ for distribution and inclusion in the database.

9.2 FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY DATABASE

9.2.1 PURPOSE

9.2 9.2.1.1 FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY DATABASE

9.2.1 PURPOSE

This Section establishes the process and requirements for the tracking of corrective actions relative to fire protection deficiencies resulting from fire protection engineering surveys.

9.2.19.2.2 9.2.2 SCOPE

9.2.2.1 This Section applies to all fire protection findings resulting from FPE surveys at LaRC.

9.2.29.2.3 9.2.3 REQUIREMENTS

9.2.3.1 9.2.3.1 Surveys shall be conducted by a FPE 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.

9.2.3.39.2.3.2 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, Status of Description, and RAC;.

~~9.2.3.4~~9.2.3.3 ~~9.2.3.3~~ An example of the printout from the FPE Survey Deficiency Database is in Appendix C.

~~9.2.3.5~~9.2.3.4 ~~9.2.3.4~~ The LaRC AHJ or designee shall validate the closure of fire protection related findings.

~~9.2.3.6~~9.2.3.5 ~~9.2.3.5~~ The LaRC AHJ shall ensure that the appropriate information is entered on the tracking system to close the finding.

~~9.2.3.7~~9.2.3.6 ~~9.2.3.6~~ The LaRC AHJ or designee shall maintain all documentation relative to corrected fire protection related findings.

~~9.3 FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY RANKING SYSTEM~~

~~9.3.1 PURPOSE~~

9.3 ~~9.3.1.1~~ FIRE PROTECTION ENGINEERING SURVEY DEFICIENCY RANKING SYSTEM

9.3.1 PURPOSE

This Section establishes a system for assessing the relative risk associated with each FPE survey deficiency and for determining the priority of abatement activities. In addition, it establishes the requirements for interim compe~~nsato~~ency measures based on the deficiency ranking.

~~9.3.1~~9.3.2 ~~9.3.2~~ SCOPE

~~9.3.2.1.~~ This process shall apply to all deficiencies noted during FPE 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.

~~9.3.2~~9.3.3 ~~9.3.3~~ REQUIREMENTS

9.3.3.1 ~~9.3.3.1~~ Deficiency Ranking System

9.3.3.1.1 ~~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 ~~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. This classification shall constitute the first step in determining the risk associated with the hazard.

9.3.3.1.3 ~~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 ~~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.

9.3.3.1.5 ~~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 and shall assign them a weight in accordance with the relative contribution of each.

9.3.3.1.6 ~~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 ~~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 or administrative controls which would provide some protection.

9.3.3.1.8 ~~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~~ mitigate them.

9.3.3.1.9 ~~9.3.3.1.9~~ The RAC assigned to each hazard is an expression of risk which combines its severity and probability. Using the matrix shown in Figure ~~3~~9.1, the RAC shall:

a. ~~a.~~ Be expressed as a single RAC classification.
b. ~~b.~~ Relate directly to a risk category that can be used as a tool to determine priorities among hazard abatement activities.

RAC	Major Category Rating Criteria	Subcategory Descriptive Criteria
	Priority Category	**Fire Protection**
V	~~Nonserious~~Non-serious 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, Risk Assessment Coding Schedule.

~~9.3.3.2 Interim Compensatory Measures~~

~~9.3.3.2.1 Interim compensatory measures shall be used to abate a hazard when the RAC is determined to be unacceptable if left unattended.~~

~~9.3.3.7~~9.3.3.2 ~~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. Limited hazardous operations.
e. Added enhanced fire protection measures~~.~~
f. Other requirements as deemed necessary by the LaRC AHJ.

~~9.3.3~~9.3.4 ~~9.3.4~~ RESPONSIBILITIES

~~9.3.4.1~~

~~9.3.4.2~~9.3.4.1 FPE shall RAC each survey deficiency to determine the overall risk rating.

~~9.3.4.3~~9.3.4.2 LaRC AHJ shall approve interim compensatory measures to be implemented as a result of a requested or granted fire protection deviation/waiver, or when justified by the hazard.

~~Facility Coordinator~~

~~9.3.4.4~~9.3.4.3 FC and/or ~~Facility Safety Head~~FSH shall ensure timely resolution of all findings ~~as a result of~~ identified by a FPE survey.

~~Renumber following sections.~~

~~9.5 FIRE HAZARD ANALYSIS PROGRAM~~

~~9.5.1 PURPOSE~~

9.4 ~~9.5.1.1~~ FIRE HAZARD ANALYSIS PROGRAM

9.4.1 PURPOSE

This Section provides the requirements for a Fire Hazard Analysis (FHA).

~~9.4.1~~9.4.2 ~~9.5.2~~ SCOPE

9.4.2.1 ~~9.5.2.1~~ The requirements of this Section shall apply to the performance of an FHA at LaRC.

9.4.2.2 An FHA is only required if it is requested by ~~SFAB Head,~~ SMAO ~~head~~Director or the LaRC AHJ.

9.4.2.2.1 ~~a.~~ If the FHA is requested, it shall comply with the requirements ~~within~~of this Section.

~~9.4.2~~9.4.3 ~~9.5.3~~ REQUIREMENTS

~~9.5.3.1~~ Facilities requiring an FHA

~~9.4.3.3~~9.4.3.1 ~~9.5.3.1.1~~ are high-value facilities, or facilities with significant fire protection and life safety issues or concerns generated ~~in~~by the fire protection engineering surveys ~~shall have an FHA prepared~~.

~~9.4.3.4~~9.4.3.2 ~~9.5.3.3~~ Competent Individual

9.4.3.2.1 ~~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~~
~~9.4.3.2.3~~9.4.3.2.2 ~~a.~~ FHAs, as a minimum, shall address the following items:

a. Description of construction~~.~~
b. Safety class systems~~.~~
c. Fire protection features~~.~~
d. Description of fire hazards~~.~~
e. Life safety considerations~~.~~
f. Critical process equipment~~.~~
g. High-value property~~.~~
h. Damage potential: maximum credible fire loss (MCFL) and maximum possible fire lo~~ss~~ad (MPFL~~).~~)
i. Fire department/brigade response~~.~~
j. Recovery potential~~.~~
k. Potential for a toxic, biological, and/or radiological incident due to a fire~~.~~
l. Emergency planning~~.~~
m. Security and safeguards considerations related to fire protection~~.~~
n. Natural hazards (earthquake, flood, wind) impact on ~~fire~~the safety~~.~~
o. Exposure fire potentials~~.~~
p. Code compliance~~.~~

~~9.4.3.5~~9.4.3.3 ~~9.5.3.5~~ Single Failure Criteria for FHAs

9.4.3.3.1 ~~9.5.3.5.1~~ Each FHA shall assume that one installed, automatic fire protection system will malfunction.

9.4.3.3.2 ~~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.

9.4.3.3.3 ~~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.

~~9.4.3.6~~9.4.3.4 ~~9.5.3.6~~ Selecting the Analysis Boundary

9.4.3.4.1 ~~9.5.3.6.1~~ The focus of the FHA shall be the individual fire areas that comprise the facility.

9.4.3.4.1.1 ~~a.~~ The boundaries of exterior fire areas (yard areas) shall be as determined by the ~~program secretarial officer or delegated authority.~~ AHJ.

9.4.3.4.1.2 ~~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.

~~9.4.3.7~~9.4.3.5 ~~9.5.3.7~~ Effect of Fire on Vulnerable Safety Class Systems

9.4.3.5.1 ~~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. ~~a.~~ This shall include those primary and supporting mechanical and electrical systems that function effectively during and after a fire event to ~~a~~ensure safety (including safe shutdown, where applicable).
b. ~~b.~~ Such safety class systems shall include, but are not limited to, process monitoring instrumentation, instrument air, facility hydraulic system, and emergency lighting system.

9.4.3.5.2 ~~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.

~~9.4.3.8~~9.4.3.6 ~~9.5.3.8~~ Credible Failure Modes for Safety Class Systems

9.4.3.6.1 ~~9.5.3.8.1~~ All credible fire related failure modes of safety class systems shall be considered.

9.4.3.6.2 ~~9.5.3.8.2~~ For example, it is ~~in~~sufficient 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 mal-operation 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 products, manual firefighting efforts, and the activation of automatic fire suppression systems shall be assessed.

~~9.4.3.9~~9.4.3.7 ~~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 mod~~e~~ of the air distribution system, as well as, alternate modes that may result from the fire, such as shutdown.

~~9.4.3.10~~9.4.3.8 ~~9.5.3.10~~ Computer Modeling

~~9.5.3.10.1~~ An approved 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 LaRC FPE and approved by the LaRC AHJ.

~~9.4.3.11~~9.4.3.9 ~~9.5.3.11~~ Simplifying Assumptions

9.4.3.9.1 ~~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.

9.4.3.9.1.1 ~~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 except where explosion hazards exist.

~~9.4.3.12~~9.4.3.10 ~~9.5.3.12~~ Combustible Material

9.4.3.10.1 ~~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 sh~~ou~~a~~l~~d also be given to the presence of transient combustibles associated with storage and maintenance activities.
9.4.3.10.1.1 Averaging combustible loading over the floor or fire area as a means to characterize the fire severity shall not be considered an acceptable technique.

~~9.4.3.13~~9.4.3.11 ~~9.5.3.13~~ Special Considerations for High-Bay Facilities and Areas

9.4.3.11.1 ~~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.

9.4.3.11.1.1 ~~a.~~ The effect of smoke movement through doors and dampers held open by fusible links shall be addressed.

~~**9.5.4 RESPONSIBILITIES**~~

9.4.4 ~~9.5.4.1~~ RESPONSIBILITIES

The LaRC AHJ shall be responsible for ensuring that FHAs are performed per this LPR when required.

10 FIRE DEPARTMENT OPERATIONS AND EMERGENCY RESPONSE

10.1 FIRE DEPARTMENT EMERGENCY APPARATUS / EQUIPMENT

10.1.1 PURPOSE

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 SCOPE~~

~~10.1.2.1~~ This Section shall apply to LaRC Fire Department, emergency apparatus / equipment used for ~~fire fighting~~firefighting, specialized rescue, hazardous materials, emergency medical response, and other types of emergency response.

~~10.1.3 REQUIREMENTS~~

10.1.3 ~~10.1.3.1~~ REQUIREMENTS

10.1.3.1 Procurement of Fire Department Emergency Apparatus / Equipment ~~and Apparatus~~

10.1.3.1.1 ~~10.1.3.1.1~~ LaRC Fire Chief shall:

a. Ensure that emergency response equipment/apparatus meets the minimum specifications of the applicable referenced NFPA standards.
b. Prepare the necessary procurement documentation according to the LaRC criteria pertaining to the procurement of equipment and apparatus.

10.1.3.2 ~~10.1.3.2~~ Use of Fire Department Emergency Equipment and Apparatus

10.1.3.2.1 ~~10.1.3.2.1~~ Fire Department Station Officer shall:

a. Develop the internal operating procedures to ensure that emergency equipment and apparatus is used properly for its intended purpose.
b. Maintain emergency equipment and apparatus according to the manufacturer's recommendations and the applicable referenced NFPA standards.
c. Ensure that emergency equipment and apparatus which does not meet the minimum specifications or is unsafe for use is removed from service and replaced with compliant equipment and apparatus.

10.1.3.3 ~~10.1.3.3~~ Responsibilities

10.1.3.3.1 ~~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 and apparatus.

10.1.3.3.2 ~~10.1.3.3.2~~ LaRC Fire Department Personnel shall report unsafe emergency equipment and apparatus to the LaRC Fire Department Station Officer.

10.2 FIRE DEPARTMENT PERSONAL PROTECTIVE EQUIPMENT

10.2.1 PURPOSE

This Section provides specific requirements for the purchase and care of personal protective equipment (PPE) used for emergency operations.

~~**10.2.2 SCOPE**~~

10.2.2 ~~10.2.2.1~~ SCOPE

This Section shall apply to personal protective equipment used for ~~fire fighting~~firefighting, rescue, hazardous materials, emergency medical, and other LaRC Fire Department emergency responses.

~~**10.2.3 REQUIREMENTS**~~

10.2.3 ~~10.2.3.1~~ REQUIREMENTS

10.2.3.1 Procurement of PPE

10.2.3.1.1 ~~10.2.3.1.1~~ LaRC Fire Chief shall prepare the necessary procurement documentation according to the LaRC criteria pertaining to the procurement of equipment.

10.2.3.2 ~~10.2.3.2~~ Use of Personal Protective Equipment

10.2.3.2.1 ~~10.2.3.2.1~~ 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 the compliant equipment.
c. Ensure the development of internal operating procedures to make sure that personal protective equipment is properly utilized for its intended purpose.

~~10.2.4 RESPONSIBILITIES~~

10.2.4 ~~10.2.4.1~~ RESPONSIBILITIES

10.2.4.1 LaRC Fire Chief shall ensure the City of Hampton Fire Department PPE program is in accordance with NFPA and NASA standards.

10.2.4.2 ~~10.2.4.2~~ 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.

10.3 FIRE FIGHTING FORCES

10.3.1 PURPOSE

This Section provides specific requirements for establishing the manual firefighting 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 ~~10.3.2.1~~ SCOPE

This Section shall apply to the LaRC fire fighting forces.

~~10.3.3 REQUIREMENTS~~

10.3.3 ~~10.3.3.1~~ REQUIREMENTS

10.3.3.1 Fire Fighting/Fire Department Staffing

10.3.3.1.1 ~~10.3.3.1.1~~ Staffing shall be arranged so that a crew with a minimum of six fire fighters, ~~with a minimum~~two of ~~two~~which being Advanced Life Support (ALS) certified, is maintained on duty at the NASA Fire Department at all times.

10.3.3.1.2 ~~10.3.3.1.2~~ Staffing shall be arranged ~~so~~such that responses to NASA facilities located on the west side of the Center are ~~responded to within~~ an average of in 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.~~ or less. Response times relate directly to the level of service provided by ~~a fire/rescue department.~~ the LaRC Fire

Department. Two elements that ~~rapid~~ response times can influence are potential fire flashover and medical injuries.

a. **FIRES/FIRE RESCUES**: The initial period in which fires build to intolerable temperatures is around ~~4~~5 minutes ~~(~~dependent upon fire loads and fire fuels present~~).~~. From ~~4~~5 minutes to 8 minutes of duration, fire temperatures can triple to over 1,200 degrees~~.~~ F. This can ~~create~~result in 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~~window is critical in the cha~~i~~nces 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 ~~10.3.3.2~~ Training of Fire Department Personnel

10.3.3.2.1 ~~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.

10.3.3.2.2 ~~10.3.3.2.2 Fire fighting~~Firefighting personnel shall have completed Hazardous Materials and Hazardous Waste Operations and Emergency Response (HAZWOPER) training.

10.3.3.3 ~~10.3.3.3~~ Fire Department Personnel

10.3.3.3.1 ~~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, apparatus, 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.
f. As required by the City of Hampton and LaRC's Space Act Agreement.

~~10.3.5~~10.3.4 ~~10.3.4~~ RESPONSIBILITIES

10.3.4.1 ~~10.3.4.1~~ LaRC Fire Chief shall ensure the City of Hampton training and qualification program for firefighters at LaRC is in accordance with NFPA and NASA standards.

10.3.4.2 ~~10.3.4.2~~ Hampton Fire Department will coordinate the training of firefighting forces.

10.3.4.3 ~~10.3.4.3~~ LaRC Fire Fighting Personnel shall perform the tasks delineated in this Section.

10.3.4.4 ~~10.3.4.4~~ LaRC Fire Department Station Officer shall:

a. Ensure that LaRC Fire Department personnel are trained to respond to all fire, life safety, and medical 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 ~~SSB.~~Security Services Branch (SSB)

10.3.4.5 ~~10.3.4.5~~ Command Structure and fire ground activity shall be conducted per NASA/City of Hampton Agreement.

10.4 MANUAL FIREFIGHTING OPERATIONS

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 product~~s~~ of combustion.

10.4.1.2 ~~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 ~~10.4.1.3~~ Precautions are taken to prevent the spread of fire(s) from Government property onto private, State, or corporate property.

10.4.1.4 ~~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 ~~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 ~~10.4.1.6~~ Response to fires and emergency shall be performed in accordance with the NASA / City of Hampton Space Act Agreement.

~~10.4.1~~10.4.2 ~~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 and other hazardous conditions within the boundaries of LaRC.

~~10.4.2~~10.4.3 ~~10.4.3~~ REQUIREMENTS

10.4.3.1 ~~10.4.3.1~~ General

10.4.3.1.1 ~~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.

10.4.3.1.1.1 ~~a.~~ Fire protection of LaRC is of the utmost importance and shall not be jeopardized or compromised.

10.4.3.2 ~~10.4.3.2~~ Fire Response

10.4.3.2.1 ~~10.4.3.2.1~~ LaRC Security Service Communication Center (SSCC) shall:

a. Dispatch LaRC Fire Department ~~officer~~ and fire suppression apparatus with the proper staffing to prevent the spread of fire to areas that contain personnel, property, or equipment.
b. Dispatch any required assistance or person(s) needed to mitigate an emergency as requested by NASA Security SOPs or as requested by the Incident Commander (IC~~)~~),
c. The SSCC shall immediately notify the LaRC Fire Chief of any fire, life safety, or medical event accruing at LaRC.
d. Facilitate communications between IC, emergency responders, external resources, mutual aid, and Duty Officer.

10.4.3.2.2 ~~10.4.3.2.2~~ Incident Commander shall:

a. Notify the applicable personnel or organizations to supply equipment, staffing and apparatus that is to be used during suppression operations.
b. Designate a staging area where apparatus and personnel are to report.
c. Request that the mutual aid agreements be ~~placed into effect~~activated, as appropriate.
~~. Advise the Facility Coordinator and/or Facility Safety Head of existing and potential conditions and that this procedure may need to be implemented.~~
~~e.~~d. With the City of Hampton, ensure the minimum responses time for west ~~side's emergency~~side emergencies is less than a four ~~minutes during~~minute average over a 30-day period.
~~f.~~e. Ensure that notifications are made to the appropriate persons: ~~Facility Coordinator~~ FC and/or ~~Facility Safety Head~~FSH; Duty Officer; and LaRC Fire Chief.
~~g.~~f. Ensure that all equipment that was placed out of service is returned to normal or automatic position.

10.4.3.2.3 ~~10.4.3.2.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ensure that preparations are made to complete the tasks as directed.

~~10.4.3~~10.4.4 ~~10.4.4~~ RESPONSIBILITIES

10.4.4.1 ~~10.4.4.1~~ Incident Command 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 ~~o~~unto Government-owned property.
c. Request fire suppression assistance according to the mutual aid agreement.

10.4.4.2 ~~10.4.4.2~~ LaRC SSCC shall:

a. Make appropriate announcements~~.~~
b. Inform the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH 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 IC.
e. By using the ~~EARS~~Emergency Alarm Response System (EARS) system, disable or re-enable fire systems as required by the IC.
f. Contact any NASA personnel, NASA Contractor, or persons that the IC needs to mitigate an emergency or hazard.

10.4.4.3 ~~10.4.4.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Take actions to secure/safeguard/protect operations and equipment when ~~informed~~requested by the IC.
b. Inform his or her managers and supervisors when the provisions of this Section are placed into effect.

~~10.1~~10.5 ~~10.5~~ FIRE DEPARTMENT TRAINING

10.5.1 ~~10.5.1~~ PURPOSE

~~10.5.1.1~~ This Section provides specific requirements for the development and implementation of LaRC Fire Department training.

10.5.2 ~~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 ~~10.5.3~~ REQUIREMENTS

10.5.3.1 ~~10.5.3.1~~ Development of Fire Department Training

10.5.3.1.1 ~~10.5.3.1.1~~ Hampton Fire Department shall:

a. Develop training which covers each facet of emergency response:
   ~~(0) Fire fighting~~
   1) Firefighting
   2) Emergency medical response
   3) Hazardous materials response
   4) Rescue
b. Develop training for routine operations and skills according to the referenced NFPA standards pertaining to professional ~~fire fighter~~firefighter competencies.
c. Ensure that training meets or exceeds the minimum requirements established in the applicable referenced NFPA standards and Virginia Department of Fire Programs.

10.5.3.2 ~~10.5.3.2~~ Implementation of Fire Department Training

10.5.3.2.1 ~~10.5.3.2.1~~ Hampton Fire Department shall:

a. Schedule and conduct training classes according to the referenced NFPA standards pertaining to the specific training course.
b. 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.
c. Ensure that all live training evolutions are conducted according to the NFPA standard governing such training and are constantly under the supervision of ~~the~~a Hampton Fire Department Safety Officer.
d. Maintain LaRC Fire Department training records for each course.
e. Upon request, provide the LaRC Fire Chief with up-to-date training records for the personnel.

10.5.3.2.2 ~~10.5.3.2.2~~ LaRC Fire Department Personnel shall:

a. Attend the scheduled fire department training sessions.
b. Maintain their minimum competency level according to the referenced NFPA standard pertaining to professional ~~fire fighter~~firefighter qualifications.
c. Conduct operations according to established training courses governing the specific operations.

10.5.3.2.3 ~~10.5.3.2.3~~ Hampton Fire Department Safety Officer ~~will~~shall 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 ~~10.5.4~~ RESPONSIBILITIES

10.5.4.1 ~~10.5.4.1 LaRC~~Hampton Fire Department ~~Personnel~~ shall develop operating procedures and implement LaRC Fire Department operating procedures.

10.5.4.2 ~~10.5.4.2~~ Hampton Fire Department shall schedule and conduct LaRC Fire Department operations procedure training.

10.5.4.3 ~~10.5.4.3~~ Hampton Fire Department Safety Officer shall maintain minimum safety standards for all LaRC Fire Department training.

~~10.2~~10.6 ~~10.6~~ FIRE DEPARTMENT MUTUAL AID AGREEMENTS

10.6.1 ~~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 ~~10.6.2~~ SCOPE

~~10.6.2.1~~ This Section shall apply to all fire department mutual aid agreements.

10.6.3 ~~10.6.3~~ RESPONSIBILITIES

10.6.3.1 ~~10.6.3.1~~ LaRC Center Director shall:

a. Ensure that an active Space Act Agreement has been signed with the City of Hampton to provide emergency services to LaRC.
b. Ensure that an active mutual aid agreement is signed with the Joint Base Langley ~~Air Force Base~~-Eustis.

***Note**: Other mutual aid agreements with surrounding fire departments are through the City of Hampton.*

10.6.3.2 ~~10.6.3.2~~ LaRC Fire Chief shall ensure that the agreements are up-to-date with the City of Hampton and ~~Langley Air Force~~Joint Base Langley-Eustis.

~~10.3~~10.7 ~~10.7~~ FIRE DEPARTMENT FACILITY INSPECTIONS

10.7.1 ~~10.7.1~~ PURPOSE

~~10.7.1.1~~ This Section establishes a program for inspecting LaRC facilities and reporting unsafe conditions or acts pertaining to fire and life safety.

10.7.2 ~~10.7.2~~ SCOPE

~~10.7.2.1~~ This Section shall apply to all personnel and facilities at LaRC.

10.7.3 ~~10.7.3~~ REQUIREMENTS

10.7.3.1 ~~10.7.3.1~~ LaRC Fire Chief or designee 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 ~~using the Audit Tracking System (ATS).~~.

10.7.3.2 ~~10.7.3.2. Inspections~~Inspection of all NASA LaRC facilities shall be performed annually~~. AHJ~~ by the LaRC Fire Department. LaRC Fire Chief has the authority to stop inspections or change inspection frequencies and dates.

10.7.3.2.1 Inspection criteria ~~is~~shall be based on individual facility types and hazards and ~~are kept in the LaRC ATS~~said criteria shall be retained.

10.7.3.3 ~~10.7.3.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall:

a. Aid the fire department in conducting facility inspections as requested, including ~~the following:~~ facilitating access and providing special escorts.
b. Ensure timely correction of all noted unsafe conditions.
c. Coordinate inspection schedule with fire department and facility personnel.

10.7.3.4 ~~10.7.3.4~~ LaRC Fire Department personnel shall perform inspections and forward reports to the LaRC Fire Chief for review and resolution ~~through the ATS system~~.

10.7.4 ~~10.7.4~~ RESPONSIBILITIES

10.7.4.1 ~~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 ~~10.7.4.2 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall support the facility fire safety program and correct facility fire safety inspection ~~findings~~program.

10.7.4.3 ~~10.7.4.3~~ LaRC Fire Department personnel shall conduct fire safety inspections in accordance with this document.

~~10.5~~10.8 ~~10.8~~ EMERGENCY MEDICAL SERVICES

10.8.1 ~~10.8.1~~ PURPOSE

~~10.8.1.1~~ This Section establishes a program for emergency medical services and response at LaRC.

10.8.2 ~~10.8.2~~ SCOPE

~~10.8.2.1~~ This Section shall apply to emergency medical response at LaRC.

10.8.3 ~~10.8.3~~ REQUIREMENTS

10.8.3.1 ~~10.8.3.1~~ The LaRC Fire Chief shall ensure the City of Hampton emergency medical responses at LaRC is in accordance with NFPA and NASA standards.

10.8.3.2 ~~10.8.3.1~~ LaRC Fire Department Station Officer shall ensure that emergency medical responses are conducted by qualified personnel.

10.8.3.3 ~~10.8.3.2~~ LaRC Fire Department Station Officer shall ensure that emergency medical responses are conducted according to the referenced ~~d~~ fire department procedures.

10.8.3.4 ~~10.8.3.3~~ LaRC Fire Department Station Officer shall ensure that medical responses are conducted according to the referenced fire department procedures.

10.8.3.5 ~~10.8.3.4~~ LaRC Fire Department Station Officer shall ensure the timely correction of all noted unsafe conditions.

10.8.3.6 ~~10.8.3.5~~ Medical units stationed at NASA LaRC shall meet the Commonwealth of Virginia requirements for the transportation of an injured person.

10.8.4 ~~10.8.4~~ RESPONSIBILITIES

10.8.4.1 ~~10.8.4.1~~ Fire Department Station Officer shall ensure requirements from on-line Medical Director are followed.

10.8.4.2 ~~10.8.4.2~~ Fire Department Station Officer shall ensure that ALS capabilities are maintained.

~~10.6~~10.9 ~~10.9~~ FIRE DEPARTMENT PREPLANS

10.9.1 ~~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 ~~10.9.2~~ SCOPE

~~10.9.2.1~~ This Section applies to the LaRC Fire Department emergency response preplans.

10.9.3 ~~10.9.3~~ REQUIREMENTS

10.9.3.1 ~~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 basis for LaRC facilities ~~bases~~.

10.9.3.2 ~~10.9.3.2~~ Development of Fire Department Preplans

~~10.9.3.2.2~~10.9.3.2.1 ~~10.9.3.2.1~~ LaRC Fire Department Station Officer shall:

a. ~~a.~~ Ensure that fire department preplans as a minimum 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
8) Maintain an up-to-date listing of hazardous materials and their locations.
9) Maintain an up-to-date listing of disabled occupants and their locations.

~~c.~~b. ~~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:~~
c. ~~a. Provide facility~~ LaRC Fire Department shall maintain hard copies of facility preplans in designated file cabinet inside apparatus bay.

~~10.9.3.2.3~~10.9.3.2.2 FC and/or FSH shall provide facility-specific support in the development of ~~an~~ accurate fire department preplans.

10.9.4 ~~10.9.4~~ RESPONSIBILITIES

10.9.4.1 ~~10.9.4.1~~ LaRC Fire Chief shall establish the schedule for the development of fire department preplans.

10.9.4.2 ~~10.9.4.2~~ LaRC Fire Department Station Officer shall:
~~Develop~~
a. Oversee the ~~preplan~~development of preplans as delineated in this Section.
b. Work with the ~~Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH to ensure the accuracy of the preplans.

~~10.9.4.3 Facility Coordinator~~FC and/or ~~Facility Safety Head~~FSH shall ~~:~~
~~10.9.4.4~~10.9.4.3 ~~a.~~ provide facility-specific input for the development of the fire department preplans.

~~10.7~~10.10 ~~10.10~~ FIRE DEPARTMENT HAZARDOUS MATERIAL RESPONSE PROGRAM

10.10.1 ~~10.10.1~~ PURPOSE

~~10.10.1.1~~ This Section establishes and implements a program that will provide the required response to hazardous materials incidents at LaRC.

10.10.2 ~~10.10.2~~ SCOPE

~~10.10.2.1~~ This Section shall apply to all of the members of the LaRC Fire Department and to ~~other~~all non-LaRC Fire Department emergency responders, as applicable.

~~10.10.5~~10.10.3 ~~10.10.3~~ REQUIREMENTS

10.10.3.1 ~~10.10.3.1~~ Hampton Fire Department shall train and provide fire service personnel certified at the NFPA Hazardous Materials Operator level.

10.10.3.2 ~~10.10.3.2~~ Hampton Fire Department shall train and provide HAZMAT Specialist and Technician level personnel for incidents at LaRC as required by NFPA and City of Hampton SOP~~'~~s.

10.10.3.3 ~~10.10.3.3~~ Emergency response personnel shall follow City of Hampton SOPs for Hazardous Material Response, as well as LPR 8715.12 – LaRC Integrated Spill Contingency Plan.

~~10.10.6~~10.10.4 ~~10.10.4~~ RESPONSIBILITIES

10.10.4.1 ~~10.10.4.1~~ Hampton Fire Department shall develop the Hazardous Materials Training Program and conduct hazardous materials training.

10.10.4.2 ~~10.10.4.2~~ Firefighters shall attend annual hazardous materials training and meet the minimum operations proficiency level.

~~.~~

APPENDIX A - DEFINITIONS

A.1 **Aging** - Large-scale deterioration over time, caused by service and the environment.

A.2 **Approved** - Acceptable to the Authority Having Jurisdiction (AHJ).

A.3 **Approved Materials** - Materials approved by Factory Mutual (FM) or listed with Underwriters Laboratories (UL).

A.4 **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.

A.5 **Authority Having Jurisdiction (AHJ)** - The individual responsible for interpreting fire, building and life safety related codes, determining intent, approving equivalencies, granting waivers, equipment, an installation, ~~or~~facility, tunnel, operation, a procedure and determining personnel qualifications.

A.6 **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.”

A.7 **Certificate of Beneficial Occupancy** - A document signed by ~~the Safety and Facility Assurance Office (SFAB) Head~~ the LaRC Fire Chief attesting that an area or facility substantially complies with ~~all~~most fire protection ~~and~~, Life and building Safety ~~Code~~ requirements, but is not in ~~literal~~full compliance with all ~~fire~~code and safety-related requirements.

A.8 **Certificate of Final Occupancy** - A document signed by the ~~SFAB Head~~LaRC Fire Chief attesting that an area, operation 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.

A.9 **Clean Room** - A room in which the concentration of airborne particles is controlled to within specific limits.

A.10 **Clean Zone** - A defined space in which the concentration of airborne particles is controlled to specific limits.

A.11 **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.

A.12 **Computer Room** - A room within the computer area that contains the electronic computer/data processing equipment.

A.13 **Construction Projects** - New facilities, facility additions, and facility alterations.

~~Deviation~~

A.14 **Equivalency** - 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. ~~A-1~~

A.15 **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.

A.16 **Exit Access** - That portion of a means of egress that leads to an exit.

A.17 **Exit Discharge** - That portion of a means of egress between the termination of an exit and the public way.

A.18 **Facility Fire Watch** - The monitoring of potentially hazardous facility conditions / operations during fire protection system ~~impairments and the monitoring of~~impairments ~~or~~ impairments or other ~~compensatory measures.~~circumstances warranting this protective measure as prescribed by the AHJ

A.19 **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.

A.20 **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.

A.21 **Fire Hazard Analysis** - A comprehensive assessment of the risks from fire within individual fire areas in a facility.

A.22 **Fire Loss** - The dollar cost of restoring damaged property to its ~~prefire~~pre-fire condition. In determining loss, the estimated damage to the facility and its contents includes replacement cost less salvage value. Losses will exclude costs of restoring (1) property that is scheduled for demolition, (2) property that is decommissioned and not carried on the books as value, and (3) property that has no loss potential. Personnel performing the loss estimate should include the cost of decontamination and cleanup, the loss of production or program continuity, the indirect costs of fire extinguishment (such as damaged fire department equipment), and consequent effects on related areas in all property loss amounts.

~~A.24~~A.23 **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 pr ~~A-2~~ safety controls, emergency ~~fire fighting~~firefighting 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.

~~A.25~~A.24 **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.

~~A.26~~A.25 **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.

~~A.27~~A.26 **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.

~~A.28~~A.27 **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.

~~A.29~~A.28 **Fire Protection System Impairment** - A shutdown of a fire protection system or portion thereof.

~~A.30~~A.29 **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.

~~A.31~~A.30 **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.

~~A.32~~A.31 **Improved Risk** - Generally, an improved risk property is one that would qualify for complete insurance coverage by the Factory Mutual System, the Industrial Risk Insurers, and other industrial insurance companies that limit their insurance underwriting to the best protected class of industrial risk. This term also implies that qualified fire protection engineering judgment has been used to obtain the highest economically justifiable level of industrial loss prevention. The most evident characteristic of an improved risk property is the existence of reliable, automatic fire extinguishing systems throughout all facilities of combustible construction or content where the facility is vital to operational continuity or may experience a large property loss from fire in the absence an automatic extinguishing system. ~~A-3~~

~~A.33~~A.32 **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.

~~A.34~~A.33 **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.

~~A.35~~A.34 **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.

~~A.36~~A.35 **Products of Combustion** - Heat, smoke, sparks, and firebrands generated by burning.

~~A.37~~A.36 **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.

~~A.38~~A.37 **Pyrophoric Material** - A material that ignites spontaneously when exposed to air.

~~A.39~~A.38 **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).

~~A.40~~A.39 **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.

~~A.41~~A.40 **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.

~~A.42~~A.41 **Shop Welding Area** - A permanently identified and fixed location in which hot work operations take place to support specific projects or facility operations.

~~A.43~~A.42 **Structure** - That which is built or constructed. The term “structure” shall be construed as if followed by the words “or portion thereof."

~~A.44~~A.43 **Temporary** - Not to exceed a period of six months.

~~A.47~~A.44 **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 hard carrier items directly under an individual's control such as toolboxes, work ~~A-4~~ documents personal protective equipment, and instrumentation devices.

~~A.48~~A.45 **Variance** - Documented and approved permission to perform some act different than established requirements.

~~A.49~~A.46 **Waiver** - ~~A variance that authorizes departure from~~Authorization to not comply with a specific safety-related requirement ~~where~~and under certain circumstances, allow for an increased level of risk ~~has been accepted~~to personnel and/or property.

~~A.50~~A.47 **Wear** - Local deterioration that is expected based on previous experience.

~~A.51~~A.48 **Work Order** - A written request for maintenance work submitted on a work order form.

APPENDIX B - ACRONYMS

ADA	American Disabilities Act
AFFF	Aqueous File Forming Foam
AGA	American Gas Association
AHJ	Authority Having Jurisdiction
ALS	Advanced Life Support
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(ing)
FSH	Facility Safety Head
FPR	Fire Protection Rating
HAZWOPER	Hazardous Materials and Hazardous Waste Operations and Emergency Response
HEPA	High-efficiency Particulate Air Filtration
IC	Incident Commander
IBC	International Building Code
IFC	International Fire Code

IMC	International Mechanical Code
IPC	International Plumbing Code
IT&M	Inspection, Testing and Maintenance
LaRC	Langley Research Center
LEL	Lower Explosive Level
LPG	Liquefied Petroleum Gas
LPR	Langley Procedural Requirements
MCFL	Maximum Credible Fire Lo~~ad~~ss
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
PPE	Personal Protective Equipment
RAC	Risk Assessment Code
SFAB	Safety and Facility Assurance Branch
SMAO	Safety and Mission Assurance Office
SOP	Standard Operating Procedures
SPE	Standard Practice Engineer
SSB	NASA Security Services Branch
SSCC	Security Service Communication Center
STD	Standard Technical Document
UL	Underwriters Laboratories

VESDA Very Early Smoke Detection Activation

~~B-1~~

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:**

APPENDIX D - FIRE PROTECTION IMPAIRMENT

1. ~~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)~~Security Service Communication Center (SSCC)) located at ~~Facility1248~~Facility 1248 – NASA Fire Station by calling 757-864-5500. 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. ~~2.EDO~~SSCC shall be promptly notified when equipment is restored back in service.